The use of Karst limestones in Vienna in the 19th and early 20th centuries — on the traces of Alois Kieslinger

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Abstract

Extensive building activity was taking place in Vienna in the second half of the 19th and the beginning of the 20th century. The continuous extension of railway lines made the transport of materials from across the former Austro-Hungarian Monarchy possible. Compact limestones from the Adriatic coast were frequently used building-materials and can be found in many Viennese monuments from this period.

The work of the Austrian geologist Alois Kieslinger (1900–1975) is the most important source of information regarding mineral materials in cultural assets in Austria. This article focuses on the representation of karst limestones in Kieslinger's written sources, his stone collection, and traces back their use in Viennese monuments.

Keywords: *karst limestone, Istria, Dalmatia, Vienna, Alois Kieslinger, 19th century*

Ključne riječi: *kraški vapnenac, Istra, Dalmacija, Beč, Alois Kieslinger, 19. stoljeće*

Introduction

The 19th century was a time of radical change in society as well as the arts and sciences throughout Europe. The technological developments resulting from industrialisation reshaped society faster than ever before. The progress and the expansion of transportation due to the spread of railways opened new possibilities in all fields of daily life and economy.

In Vienna the 19th century was a time of growth and prospect. The city was expanding with a speed never experienced before; in 1850, Vienna had just over half a million inhabitants, while 40 years later, in 1890, the number of inhabitants was already approaching 1.5 million![1] It was the biggest political, economic, and cultural centre of the Austro-Hungarian Monarchy and served as the capital after 1867. More and more people of different cultures and ethnicities, coming from different provinces of the empire and speaking different languages, came to Vienna to live and work. The city had to cope with extremely fast growth and responded with a massive building initiative, both regarding infrastructure as well as residential and representative buildings.

Due to this massive development, Vienna was lacking building materials during the 19th century.[2] The stone quarries in the direct surroundings of Vienna often met their limits and some became over-exploited, thus, only low-quality material could be provided. Furthermore, the brick industry was also at its limits and frequent reports of lack of coal as a fuel for brick production can be found in different sources. In the middle of this constant lack of materials, the increasing use of steam power in locomotives, along with the expanding railway lines, made it possible to transport construction materials further than ever before. This was done in an economically reasonable manner even though the transport was conducted on "terra firma."[3] Therefore, with every new railway line connecting Vienna to different parts of the empire (Vienna-Brno 1837, Vienna-Budapest 1850, Vienna-Trieste 1857, etc.),[4] new possibilities opened for building stones; they could easily and cheaply be transported to the city.

The year 1857 is very important in this context because of two reasons:

On the one hand, it was the starting point for the biggest reshaping of Vienna as a city. In this year the enormous construction project "Ringstrasse" was launched. Until the mid-19th century, the city of Vienna had the shape and structure of a typical mediaeval town. The city centre (today's 1st district) was protected by city walls and a "glacis," a green belt. The walls were demolished in the mid-19th century and the glacis was open for building activity.[5] Here, in the middle of the city, a tremendous "new" space was gained, where palaces of rich families, but also representative buildings, found their place. The "Christmas Note" of 1857, by the Emperor Franz Joseph, documents the official start of the Ringstrasse. Between 1860 and 1900 around 800 buildings were erected there.[6]

On the other hand, the new railway line between Vienna and Trieste was opened in the same year and a new transport route for a great number of different building stones, among others the karst limestones from Istria and Dalmatia, was established.[7] The term *karst limestone* (in Kieslinger's phrasing, also "karst marble") describes the compact limestone types formed in the structural complex of the Adriatic carbonate platform, the so-called Adriaticum, between the Late-Jurassic and Paleogene (predominantly in the Cretaceous).[8] These limestones are often very compact and homogeneous, most of them can be polished and are resistant to abrasion. Due to their good quality, they can be quarried in large blocks which makes them an excellent carving material. The large amount of high-quality compact limestone was more than welcome in the huge construction site of Vienna and the demand was directly connected to the building activity in the city. For the owners of quarries, the supplies for the construction of the Ringstrasse were an once-in-a-lifetime opportunity. After the building activity flattened at the beginning of the 20th century, and then totally ceased in the course of the First World War, many of the Istrian quarries i.e., at Rovigno (Rovinj) and Orsera (Vrsar), etc., had to stop operating due to lack of orders. Only a few of them could supply material for subordinate purposes such as lime and cement production.

1 See https://de.wikipedia.org/wiki/Demografie_Wiens (access May 31 2022).
2 Alois KIESLINGER, *Die Steine der Wiener Ringstrasse,* 58.
3 The transport on water ways has always been economically more sustainable than transport on sound ground (terra firma).
4 A. KIESLINGER, *Die Steine,* 59.
5 Kurt MOLLIK, Hermann REINING, and Rudolf WURZER, *Planung und Verwirklichung der Wiener Ringstrassenzone,* 77ff.
6 A. KIESLINGER, *Die Steine,* 58.
7 A. KIESLINGER, *Die Steine,* 59.
8 Branko CRNKOVIĆ and Dragmonir JOVIČIĆ, *Dimension Stone Deposits in Croatia, Rudarsko-geološko-naftni zbornik,* 5 (1993) 1, 143.

Alois Kieslinger and his Work

Alois Kieslinger was born in 1900 in Vienna, where he also habilitated in 1930 at the University of Technology Vienna (TU). From 1937 he worked at the TU as an associate professor. Parallel to his teaching activities at the university, Kieslinger was employed at the Geological Survey of Austria. During the Second World War he was at the so-called Reichsamt für Bodenforschung (Office Soil Research), where he was mainly working on a register of stone quarries within the former Austrian-German Territory. This study and the research of stone quarries awoke Kieslinger's further interest in building stones. During the reconstruction activities after WWII, he became the Chief Geologist of the Federal Monuments Authority Austria (Bundesdenkmalamt– BDA). In 1949, he joined the Committee of the Geological Institute (TU) as a member, where he became an ordinarius in 1954. Kieslinger stayed at the TU until he retired as eremitus in 1970. He died in 1975.[9]

Alois Kieslinger wrote a great number of articles and books focusing on stones used in the built heritage of Austria. His overwhelming collection of hand-specimens representing mineral materials from many regions of the former Austro-Hungarian Empire, but also including numerous samples from around the world, is probably one of the most interesting historical stone specimen collections in Europe. It bears research potential in terms of the representation of used stones, but also as a pool of historically important information concerning material sources and the connection to his scientific literature as well as the monuments themselves. The collection has recently been relocated from the TU to the Department for Internal and External Training and further Education of the BDA in the Charterhouse in Mauerbach, Lower Austria. A joint research project by the Institute of Conservation at the University of Applied Arts Vienna (IoC), the Association for the Promotion of Monument Preservation, and the BDA aims to document, digitise, and analyse the collection in the forthcoming years. A further collection, including rock thin sections produced from the stone materials of his hand-specimen collection, is still kept at theTU and represents the third part of Alois Kieslinger's legacy. These three elements, namely his written sources, the stone specimen collection, and the thin sections, offer a great potential for further research of the stone materials used in the built heritage in Austria. Kieslinger's building materials collection includes approximately 3,000 different mineral materials, mostly stones, but also sand and clay samples, historical bricks, and glasses from the territory of the former Austro-Hungarian Monarchy, as well as other European and overseas countries. The majority of samples are of hand-specimen size, but a few larger, polished slabs can also be found. Compared to the size and diversity of the collection a significant number (i.e., 60 to 80 pieces) of karst limestone was found in the stock. In the present contribution, five building stones, used in larger quantities in the Viennese construction activities during the 19th century, were selected for further petrographic characterization. (Fig. 1) After the photographic documentation, small chips were taken from the hand-specimen and petrographic thin sections of 30 microns standard thickness were prepared and subsequently characterised by polarised light microscopy. The textural classification was carried out after Folk and Dunham.[10]

Fig. 1. Characteristic examples of karst limestone hand-specimens from Kieslinger's collection

9 Christine BACHL-HOFMANN and Astrid ROHRHOFER, Dokumentation und Evaluation des Nachlasses von Prof. Dr. Alois Kieslinger (1900-1875) unter besonderer Berücksichtigung bautechnisch wesentlicher Mineralrohstoffe und ingenieurgeologischer Fragestellungen, in: Berichte der Geologischen Bundesanstalt (ed.), Nr. 37, Vienna: Geologische Bundesanstalt, 1997, 2–3.

10 See: Robert L. FOLK, Practical Classification of Limestones; Bulletin of the American Association of Petroleum Geologists (AAPG Bulletin), 43 (1959) 1, 1–38., Robert J. DUNHAM, Classification of Carbonate Rocks According to Depositional Texture, Bulletin of the American Association of Petroleum Geologists (AAPG Bulletin), 43 (1959) 1, 1–38.

Case Studies from Vienna

The following section attempts to follow Kieslinger´s written sources in his book *Die Steine der Wiener Ringstrasse* (The Stones of the Viennese Ringstrasse)[11] on the use of Istrian and Dalmatian stones in the built heritage of Vienna. His most important book about the use of building stones in Vienna was published three years before his death, in 1972, and represents the most detailed description of hundreds of Viennese buildings, their construction history, and applied building materials. Table 1 presents a list of the most meaningful mentions of Istrian and Dalmatian limestones in the book. In our paper, five important monuments are presented in more detail. The analysis of each object included the verification of the used karst limestone types compared with the data in Kieslinger's book, the description and investigation of the same stone type in his hand-specimen collection including a microscopic analysis, as well as a visit on site to revise the preservation state or changes that occurred to the monument over time.

Votive Church (Votivkirche)

The Votive Church *(Votivkirche)* in Vienna by the architect Heinrich Ferstl was one of the first buildings on the former glacis.[12] The construction started in 1856 before the official start of the Ringstrasse project and the opening of the railway connection between Vienna and Trieste. The church itself was the first big construction in Vienna after almost a century[13] and therefore it was accompanied by a large amoung of uncertainty regarding possible building materials. However, after a thorough search, limestone from Wöllersdorf and a conglomerate from Bad Fischau (both Lower Austria) were selected and used for the facades. Next to these two local stones, Istrian and Dalmatian limestones were also used after the opening of the Southern railway line in 1857. These stone materials were especially applied to ornaments and sculptures on the outside and the inside of the church. The stone from Grožnjan (Grisignana) in Istria was used for sculptures, for different elements of the altars, as well as material for the pulpit of the church. (Fig. 2–3)

Fig. 2. Overview of the pulpit, Votive Church, 2021

The pulpit is a typical work of the 19th century, combining traditional crafts (stone carving, metal works, and glass mosaic) with innovative production techniques, such as screws for the metal connections and stone surfaces worked with a stock-hammer[14] (Fig. 3). Currently, the pulpit is undergoing a conservation activity conducted by the IoC, which allowed for some close-up observations. For more insights into the stone material used for the construction of the pulpit, a small stone chip was removed from a damaged part of the object. Investigation into the polarised light microscope revealed a dense microstructure containing large amounts of small shell fragments and peloids embedded in a sparic calcite matrix, therefore the stone can be described as an oobiosparite, grainstone (Fig. 3). During the conservation process different technological details were revealed. Many of the carved elements still present very "fresh" surfaces, construction lines in pencil

11 See: A, KIESLINGER, *Die Steine.*

12 Renate WAGNER-RIEGER, *Das Kunstwerk im Bild,* 17.

13 A. KIESLINGER, *Die Steine,* 172.

14 In Vienna the stock-hammer appeared only after 1850.

Fig. 3. Top: stone surfaces worked with a stock-hammer, 2021. Bottom: micrograph of the stone's texture (optical microscope, plane-polarized light, OM-PPL)

or scratched in the surfaces can be observed. An interesting detail is the mosaic and "pseudo-mosaic" distribution on the pulpit. While the mosaic in the lower half of the pulpit is a real glass tesserae mosaic, the one in the upper part is "only" painted. This difference can only be seen from up close.

The pulpit is in a very good state of preservation. The rather young age and the sheltered exposure in the church are responsible for this situation, only the accumulation of dust, as well as sporadic mechanical defects, can be observed.

City Hall **(Rathaus)**

The City Hall *(Rathaus)* was erected between 1872 and 1883 under the supervision of Friedrich Schmidt. The facing masonry shows stones from Wöllersdorf, Mannersdorf (Lower Austria), and Oslip (Burgenland). A further, exotic, porous limestone type can be found on the exterior sculptures carved from the French Savonnière stone, a porose oolithic limestone, which was also a popular building material in Vienna at this time. In the whole building many applications of karst limestones, mainly used for columns, cornices, and capitals, can be found. The large columns in the staircase originate from San Girolamo in Italy. For the columns in the loggia, the central balcony of the facade, material from quarries in Grisignana, Grožnjan was used (Fig. 4).

Fig. 4. Detail of a column at the loggia, 2022

Fig. 5. Overview of two sculptures within the festival hall, 2022

Also, the large sculptures in the festival hall are partly made of Grisignana stone (Fig. 5), next to Mannersdorfer, Castiglieri (Italy), Savonnière, and Untersberger (Salzburg, Austria) limestones. Similar to the facade of the Burgtheater (see next monument, Fig. 7–8), many parts of the interior and the exterior of the City Hall are made out of karst limestones from Istria.[15] The general state of preservation can be described as good, even though the columns show some erosion on one site (more frequently weathered). The sculptures in the interior are in perfect condition and show only slight dust deposits.

Fig. 7. Overview of the main facade of the Burgtheater, 2022

15 A. KIESLINGER, *Die Steine,* 200–207.

Fig. 8. Detail of door soffit–Wöllersdorfer at the lower part and Pula limestone at the upper, 2022

Despite its good quality, this white, biogenic limestone from Grožnjan exhibits a considerable amount of microporosity. The elongated structures which can be seen on the sample from Kieslinger's hand-specimen (Fig. 6) are probably remnants of a skeletal calcareous alga cemented predominantly by coarse sparry, ancillary by micritic calcite. After the classification system of Folk and Dunham, the stone is a biosparite/wackestone.

By comparing the microstructure of the sample taken from the Votive church's pulpit (see Fig. 3) with that of the hand specimen from Kieslinger´s collection (Fig. 6), we found two limestone types which were formed under different environmental circumstances. This means that the reference material from Grožnjan (i.e., the sample from the collection) and the stone material of the pulpit do not belong to the same geological strata. Nevertheless, it cannot be excluded that they belong to the same geological formation and thus both were quarried/collected in the region of Grožnjan. The clarification of this question is out of the scope of this study and indicates that the exact provenance of building stones is often a sophisticated task and should be based on the comprehensive research of literature sources and the analysis of samples.

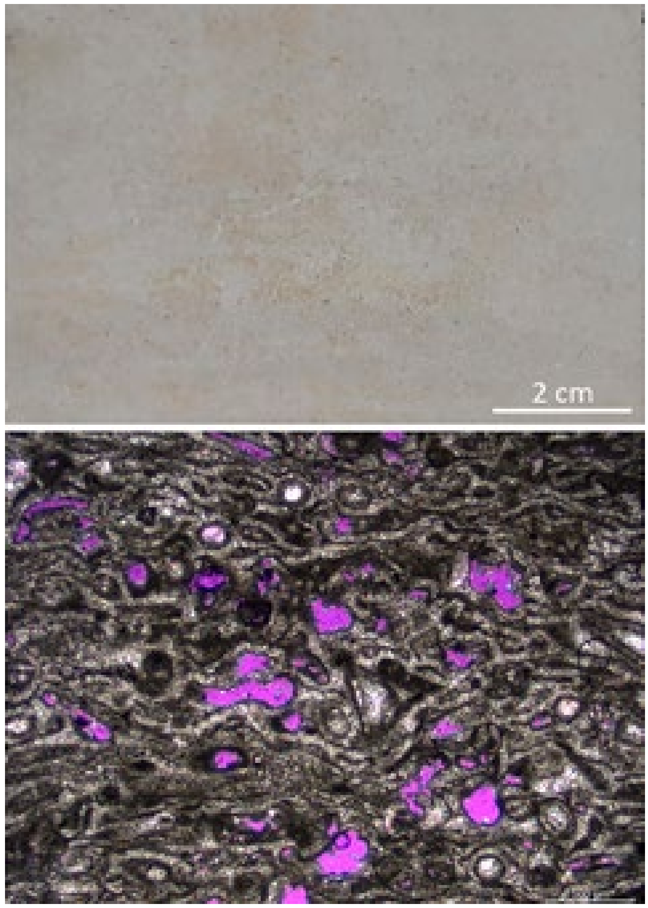

Fig. 6. Fine-grained Grožnjan (Grisignana) stone from Keislinger's collection (top). Micrograph of the stone's texture (magenta: porosity) with residue of skeletal calcareous alga (brown). Optical microscopy, cross-polarized light with lambda plate (OM-XPL/lambda)

Burgtheater

The theatre was built in 1874-88 as part of the main building phase of the Ringstrasse by the architects Gottfried Semper and Carl Hasenauer. The problems due to the scarcity of building materials can also be observed here, even though large amounts of stone were already arriving with the railway from Trieste on a daily basis. The vast construction site in Vienna was also reaching the limits of subcontractors as well as quarry owners in Istria and Dalmatia. The Burgtheater was therefore constructed using a mix of different types of compact and porous limestones. The use of the stone materials was determined by the orientation of the facades and the different levels of the building. The main (front) facade was, mostly, made of more durable and compact limestones, whereas for the back side, softer and more porous limestones were used. Despite some exceptions, the stone materials of the front facade can be described as follows: the lowest part was made of the local Wöllersdorf limestone, for the ground floor the Istrian limestone from Pula (also called Pola or Pomer) was used, and the upper floor was made of Marčana limestone (also known as Marzana) from Istria. The sculptures on the attica and the big relief under them are made of Istrian limestone from Ližnjan (the stone is also known as Merlera or Lisignano) (Fig. 7-8).

Two stone types used at the Burgtheater were selected from Kieslinger's collection to make a detailed petrographic description. The off-white Pomer stone from Pula contains large (0.5 to 1 mm), round shell fragments and also some intraclasts cemented in a coarse calcium carbonate matrix. The grain supported texture contains many intraganular pores. The rock can be classified after Folk and Dunham as an intrabiosparite and grainstone, respectively (Fig. 9). The off-white, biogenic Marčana limestone exhibits fine-grained allochems.[16] Similarly to the Pomer stone, this limestone also contains large amounts of bioclasts (mostly fine-grained shell residues of bivalves) and a considerable amount of round calcium carbonate peloids; however the size of the single components is much smaller than that of the Pomer stone. The texture is grain-supported and cemented by micrite (micritic calcite). This rock type also exhibits a higher macro- and microporosity indicated by the magenta color in the micrograph (Fig. 10). The rock can be classified as a biopelmicirte/packstone..

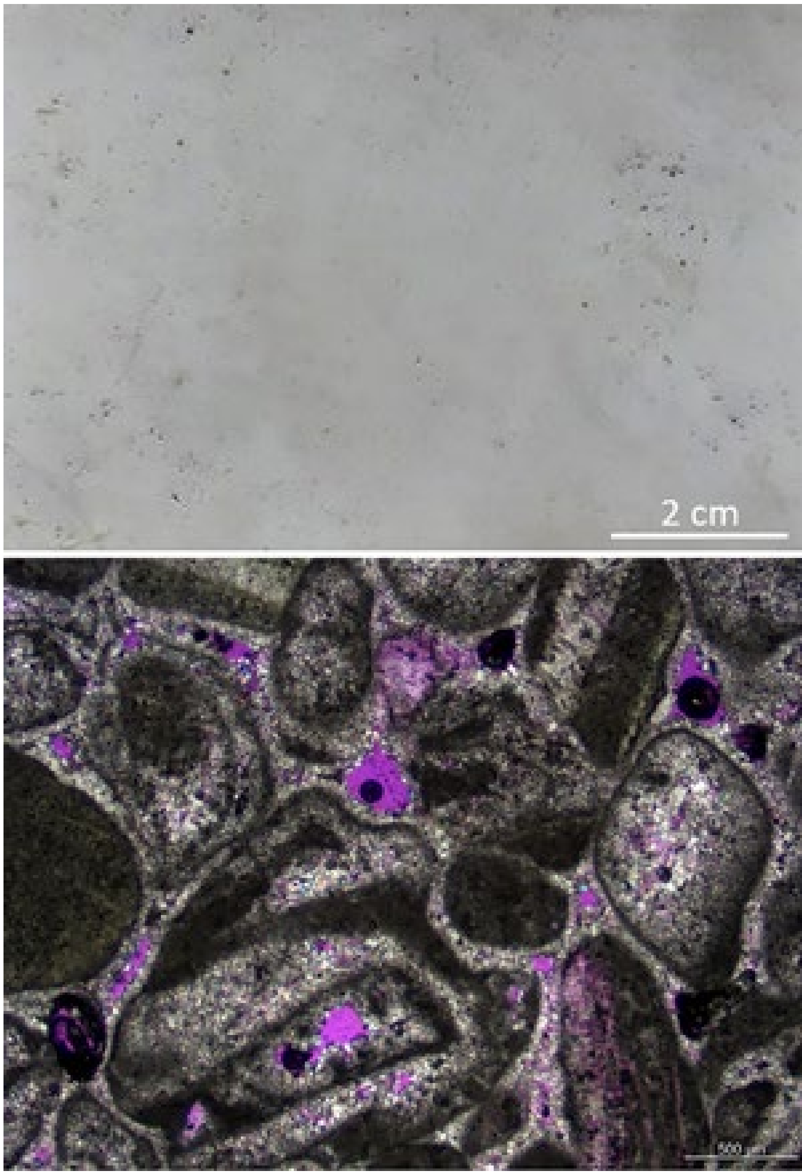

Fig. 9. Polished surface of the Pomer stone (top) and (bottom) the porous (porosity = magenta areas) microstructure made up of coarse shell fragments (brown). OM-XPL/lambda

16 Aggregates of carbonate sediments which have formed within the basin of deposition (e.g., shell fragments, peloids, etc.).

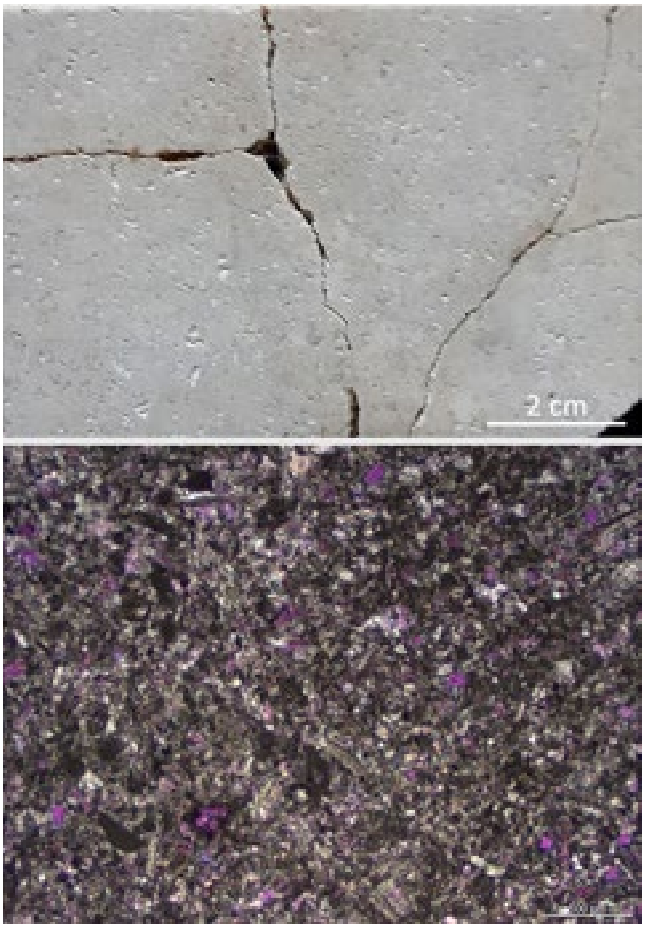

Fig. 10. Fine-grained Marzano (Marčana) stone from Keislinger's collection (top). Micrograph of the stone's texture (magenta: porosity). OM-XPL/lambda (bottom)

The Burgtheater was bombed in WWII and the resulting fire destroyed parts of the interior and of the facade. Therefore, during the extensive restoration works in the 1950s, whole stone elements had to be exchanged. The most recent conservation treatment was conducted in 2001/2002 and today the building presents itself in a good state of preservation showing only minor weathering phenomena.

The Monument of Empress Elisabeth (Kaiserin-Elisabeth-Denkmal) in the Volksgarten

This monument by Friedrich Ohmann (architect) and Hans Bitterlich (sculptor), or more precisely the area of the Volksgarten, was finished in 1907 and comprises the monument to "Sisi", fountains, benches, and columns (Fig. 11). The single elements adding up to a separate part of the garden achieve a sort of private area which invites visitors to sit and spend some time here. Three different stones were used for the construction: a white marble from Laas in South Tirol, a grey layered marble from Norway and, in our case the most important one, a limestone from Trogir known as the "Seghetto" or "Seget" stone. It has to be mentioned that the different stones present different surface workmanship. While the marbles exhibit finely sanded surfaces, the limestone from Trogir wears a lively boasted finish and therefore stands in contrast to the marble surfaces (Fig. 12).

Fig. 11. Overview of the "Sisi" monument, 2022

Fig. 12. Detail of Trogir stone with lively boasted surface, 2022

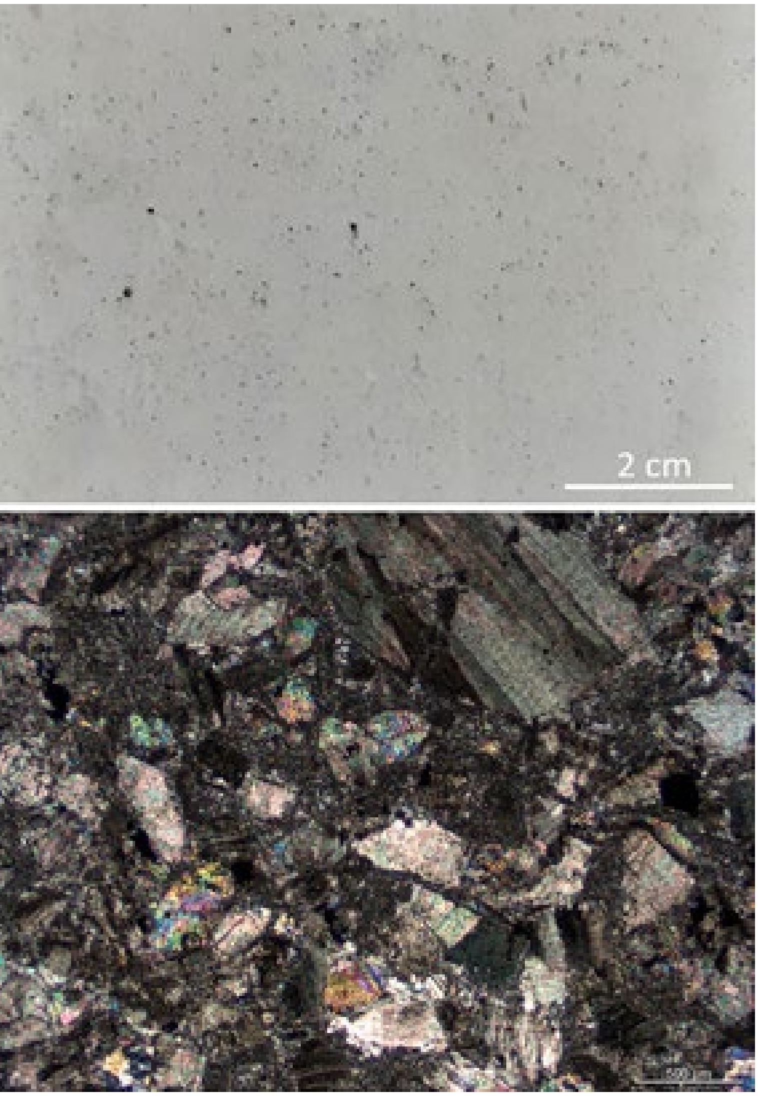

Fig. 13. Polished surface of the Seghetto stone with a few pores (top) and the dense microstructure made up of shell fragments and micritic cement. OM-XPL (bottom).

Although this monument is the only one mentioned by Kieslinger to be made of the limestone from Trogir, a specimen from the "Seghetto" could be found in the collection.[17] The off-white, compact biogenic limestone from the hand-specimen collection reveals under the microscope large amounts of bioclasts (mostly shell fragments), probably belonging to Rudist bivalves.[18] The texture is matrix-supported and cemented by microcrystalline calcite and due to the arrangement of the components the porosity is very low (Fig. 13). The rock can be classified as a packed biomicrite, wackestone. The state of preservation of the monument is good and apart from soiling and biological attack almost no other decay and/or damage pattern can be observed.

New Imperial Palace **(Neue Hofburg)** ***and the Festival Hall Wing*** **(Festsaaltrakt)**

The centre of the former Habsburg dynasty was the Hofburg. First construction activities can be dated back to the 13th century and were extended several times afterwards. The last extension of the Hofburg started in 1881 under the architect Carl Hasenauer and ended in 1965 with the adaptations for the National Library. This long-lasting construction activity can partly be explained with the outcome of WWI. After the end of the war, the supplying quarries were no longer part of the Empire, so deliveries became subsequently sparser. Even before, during the existence of the Monarchy, emperor Franz Joseph was trying to distance himself from the luxury of the project and the architectural style that was no longer in fashion. The existing Festival Hall Wing (1804/05 by Montoyer) was extended and adapted by Baumann in 1913. Within the wing, the new vestibule and staircase present the use of different karst limestones. The stairs show stones from Grožnjan (Grisignana), whereas the balustrade is a mixture of natural stone and scagliola,[19] which imitates the stone used (Fig. 14).

17 A. KIESLINGER, Die Steine, 530.
18 Box-, tube-, or ring-shaped marine, reef-building bivalves that arose and became extinct during the Mesozoic.
19 Commonly known as "stucco marble".

Fig. 14. Detail of the staircase of the Festival Hall Wing at the Hofburg, 2022

Fig. 15. Overview of the vases at the ground floor, 2022

This imitation was probably a reaction to supply difficulties, as the continuity of use varied considerably. Vases in semi-circular niches on the ground floor are made of stone from Brač, showing different kinds of tool marks. (Fig. 15) The base is worked with a stock-hammer, geometrical ornaments are polished, and floral decoration and cornucopias are sanded. The protected interior results in a very good preservation state, some stone elements show slightly soiled surfaces (dust deposits).

Moving to the outside, the facade facing Heldenplatz was designed by several architects and originally planned entirely in Marzano stone (Marčana). Since this probably could not be supplied in the needed quantities, other karst stones came to use, among others the stone of Pučišća on the Island of Brač (Fig. 16).[20]

On the polished greyish beige surface of this compact biogenic limestone, darker fossil fragments are visible with the naked eye (Fig. 17). The limestone reveals large amounts of bioclasts (i.e., shell fragments) belonging to Rudists, a group of extinct marine heterodont bivalves. Further allochems are peloids and a few echinoderm fragments. The texture is grain-supported and cemented predominantly by sparry, ancillary by micritic calcite. The rock is classified as a biopelsparite/packstone.

The enormous facade is generally in good condition. Re-entrant angles show blackening mainly due to dust particles embedded in a gypsum crust. Other typical soiling of outdoor exposed stone surfaces can be observed as well. In a few areas, which are missing the eaves edge, advanced weathering is evident.

Fig. 16. Overview of the facade of the Hofburg, 2022

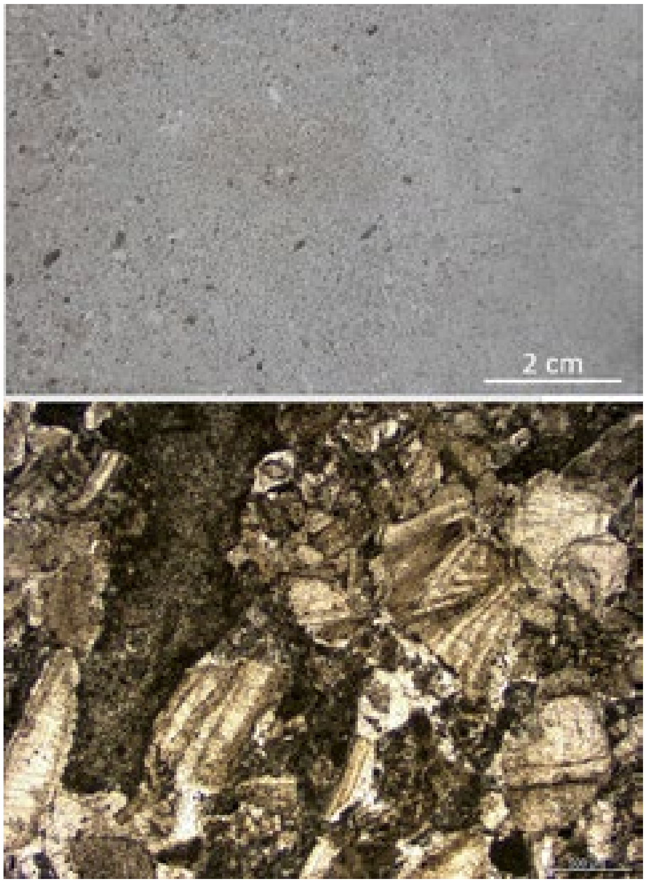

Fig. 17. Polished surface of the Pučišća stone with brown fragments of fossils visible by the naked eye (top) and the dense microstructure made up of coarse shell fragments and micritic cement, OM-PPL (bottom).

Summary

The extensive construction activity which was taking place in Vienna in the second half of the 19th and the beginning of the 20th centuries, along with the continuous extension of railway lines, accelerated the transport of building materials within the territory of the Austro-Hungarian Monarchy. Compact limestones from the Adriatic coast were frequently used as construction materials in many buildings of this period. Due to their compactness and resistance against abrasion, these stones were often used for stairs and floors, as well as material for sculptures and decorative elements. Their use can be observed in different buildings such as theatres, churches, apartment buildings, as well as residences and town halls.

The work of the Austrian geologist Alois Kieslinger (1900-1975), his books and other publications, as well as his extensive stone specimen collection, contain information

20 A. KIESLINGER, *Die Steine,* 257–277.

about the use of these stones in cultural assets in Austria. This article focuses on the representation of the karst limestones of Istria and Dalmatia in Kieslinger's written sources, his stone collection, and traces back their use on and in Viennese monuments and their current condition. Five different monuments were chosen to represent these building materials in Vienna. The buildings were visited, the use of the material verified, and the state of preservation reviewed. A petrographic sample was taken from the related hand-specimen from Kieslinger's collection and thereafter analysed.

It can be concluded that enormous amounts of limestone from Istria and Dalmatia were used in Vienna for different buildings after 1857. The stones were applied for different purposes and also present different surface finishes (rough-boasted to fine-polished). Even though there were many (new) available quarries, material supply was not constant, so many buildings show an unplanned change in the use of material; different stones or even scagliola was used indoors. The state of preservation of the assets made of these stones are different. In the outdoor environment, the stone surfaces present different kinds of decay and damage patterns, such as surface recession, sulphation, as well as mechanical damage such as cracks and/or missing parts. Indoors, mostly only dust deposits and minor mechanical damage can be noted. However, the overall average state of preservation can be described as good when compared to other groups of stones such as the more porous, local limestones from the East of Austria (i.e., Lorretto, Au, and Breitenbrunn, but also Zogelsdorf or St. Margarethen).

Stone	Building / Monument	Location of Monument	Usage Stone	Mentioned on page
General mentioned as "Karstmarmor" (Karst marble)				
	Deutschmeister-palais / Palais Erzherzog Wilhelm	Parkring 8–Cobdengasse 3, 1010	Façade, Balustrade of the main staircase	48, 315
	Former residential and commercial building "Michael Hainisch"	Parkring 8–Cobdengasse 3, 1010	Façade, Balustrade of the main staircase	424
"dense Istrian," Aurisina	University of Vienna	Universitätsring 1, 1010	Columns of staircases, former "Lawyer's Staircase"	195
	Between University of applied Arts Vienna and MAK–Austrian Museum of Applied Arts	Stubenring 5, 1010	Fountain at the Athene Mosaik	92
"probably Karst"	Old main building of the University of applied Arts Vienna Angewandte	Stubenring 3, 1010	Balustrade and stairs	324
	Otto-Wagner-Haus	Garnisongasse 1–Universitätsstraße 12–Frankhplatz 2, 1090	Vestibule plinth	365
Sta Croce/ Cava Romana	Burgtheater	Universitätsring 2, 1010	loge arch (Sta Croce), smaller stairs (Cava Romana)	221
Sta Croce/ Arco/ Marzana (lions)	Palace of Justice	Schmerlingplatz 10–11, 1010	Postaments in the main vestibule from Arco; four columns in front of hall Sta Croce	239-241
	Parliament	Dr. Karl Renner Ring 3, 1010	Caryatids under the terraces of the passages, facade cladding	234
"Istrian"	Dwelling house Newelka	Berggasse 8–Wasagasse 15, 1090	Main stairs	350
	Officials' apartment house Rudolfshof	Türkenstr. 14–Hörlgasse 15–Schlickgasse 5, 1090	Simple stair treads	352
	Dwelling house Samuel Heit	Rudolfsplatz 10, 1010	Staircase	372
	Bank	Hohenstaufengasse 3, 1010	Stairs	384
	Dwelling house	Reichsratstraße 15–17–Liebiggasse 2, 1010	Stairs	395

	Maria Theresien-Hof	Währinger Straße 2–4 –Kolingasse 2–Maria Theresien-Straße 1, 1090	Large three-armed staircase and right pedestal of the bronze figure	357
	Dwelling house Hollitzer	Rooseveltplatz 10/11/ Ferstelgasse 2/ Günthergasse 1	Staircase with two columns	361
	Dwelling house Union Baugesellschaft	Ebendorferstraße 4, 1010	stairs	399
	Student center of the catholic University community Vienna; former apartment house Moriz Karpeles	Ebendorferstraße 8–Grillparzerstraße 6, 1010	All sections of the foyer	401
	Leashold house Fürst Emanuel Collalto	Landesgerichtsstraße 18–Liebiggasse 9, 1010	Stairs and different stone at balustrade (Karst limestone)	402
	Palais Ephrussi	Universitätsring 14, 1010	Stairs	407
	Austrian Trade Union Federation	Treitlstraße 3–Operngasse 9, 1010	Stair pillars and steps	432
	Palais Carl Lützow	Bösendorferstraße 13–Dumbastraße 4, 1010	Staircase	457
	Haus der Kaufmannschaft	Schwarzenbergplatz 14–Lothringerstraße 10, 1030	Stairs	464
	Residential building Gutmann (former AEG house)	Schwarzenbergplatz 11–Schwindgasse 2–Gusshausstraße 1, 1040	Upper stairs and balustrade	462
	Haus der Baseler-Versicherung	Lothringerstraße 16–Lisztstraße 2, 1030	Portal framing	471
	Federal building/ trade school	Entrance Fichtegasse 4, 1010	Stairs	490
	Courthouse	Riemergasse 7–Zedlitzgasse 2, 1010	Main staircase	491
Santa Croce?	Palais Klein	Dr. Karl Lueger–Platz 2, 1010	Fluted ionic columns	494
	Federal Building	Marxergasse 2–Vordere Zollamtstraße 9–Gigergasse 2, 1030	Stairs	504
	Former residential and commercial building Heinrich Sortsch	Franz Josefs Kai 5–Aspernplatz 4–Wiesingerstraße 11, 1010	Ground floor with cladding	507
Trieste sorrounding	Animal drinking fountain	Gumpendorferstraße, 1060	Ground floor with cladding	567
“Splitska”	Residential and commercial building Jonas v. Königswarter	Burgring 3–Babenbergerstraße 1, 1010	Stone facade with thick slabs of Dalmatian limestone	411

"Kopriva"	State Opera	Entrance Kärntner Straße, 1010	Parterre Gardarobe, floor	294
"Kopriva"	Wiener Börse	Schottenring 16–Wipplingerstraße 34–Börseplatz 2- Börsegasse 11, 1010	Pavement of the large hall	184
General mentioned as "Karstmarmor" (Karst marble)				
	Neue Hofburg–Festival Hall Wing	Heldenplatz, 1010	Festival hall staircase	96, 275
	Kunst-und Naturhistorisches Museum	Maria-Theresienplatz, 1010	Window parapet on the mezzanine, parts of the window columns	248
	State Opera	Opernring 2, 1010	Schwind foyer, standing parterre cloakroom	294
"Istrian"	Votiv Church	Roosveltplatz, 1090	Sculptures on facade, smaller architectural works, stairs at main altar, pulpit, canopy over altar	100, 172, 174
	Rathaus	Rathausplatz 1, 1010	Columns of the loggia and canopies with statues in the great banquet hall	201-202
	Burgtheater	Univeristätsring 2, 1010	Univeristätsring 2, 1010	217, 221
	Telecommunications Office	Schillerplatz 4, 1010	Staircase landings (matt polished)	412
	Palace of Justice	Schmerlingplatz 10-11, 1010	Outdoor columns, balustrades	240
	University of Vienna	Universitätsring 1, 1010	Architectural outlines (façade)	192
	Museum of Ethnology	Heldenplatz, 1010	Vestibule stairs, pavement	266
Nabresina				
Santa Croce	Neue Hofburg	Heldenplatz, 1010	Side stairs	96, 266
Santa Croce	University of Vienna	Universitätsring 1, 1010	Staircase no. IX	196
	Palace of Justice	Schmerlingplatz 10–11, 1010	Columns of the pavilions above the corner risalites	240
	Wiener Börse	Schottenring 16–Wipplingerstraße 34–Börseplatz 2–Börsegasse 11, 1010	Framing of the reliefs (attica), framing of windows	182, 185
	Parliament	Dr. Karl Renner Ring 3, 1010	central portico twelve fluted columns	233

Brač				
Pučišća, Marzano	Museum of Ethnology	Heldenplatz, 1010	Facade	266
Pučišća	Haus der Industrie	Schwarzenbergplatz 4, 1030	Stairs and pilasters	458
Veselje	Neue Burg–Festival Hall Wing	Heldenplatz, 1010	Ornamental vases	275
Pučišća	MAK–Austrian Museum of Applied Arts	Stubenring 5, 1010	Extension building-columns at the entrance	324
Pučišća	Strauß-Vater-Lanner-Monument	Rathauspark, 1010	Base and curved wall	523

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Sažetak

Upotreba krških vapnenaca u Beču u 19. i ranom 20. stoljeću: tragom Aloisa Kieslingera

Razdoblje od druge polovice 19. do početka 20. stoljeća, koje korespondira s posljednjim desetljećima Austro-Ugarske Monarhije, za Beč je bilo razdoblje intenzivne izgradnje. Lokalni kamenolomi bili su pred iscrpljenjem, a potražnja za građevnim materijalom ostala je i dalje velika. Istovremeno, intenzivno se razvijala željeznička mreža Monarhije. 1857. godine otvorena je pruga koja je povezala Beč s Trstom. Krajem iste godine, Car je najavio službeni početak rušenja bečkih zidina, što je ujedno bio signal za obnovu grada i građevinski procvat, koji će uslijediti. S novim željezničkim linijama pojavili su se i brojni dobavljači građevnog materijala, za kojim je postojala nasušna potreba. Željezničkim spajanje s jadranskom obalom, mnogi vapnenci iz obalnih kamenoloma, od Trsta do Splita, sada su se mogli mnogo brže nego ranije prevoziti do Beča. Zbog svoje kompaktnosti i otpornosti na habanje, taj se kamen u spomenutom razdoblju često koristio kao građevni materijal. Krški vapnenac (njem. Karstkalkstein) poznat i kao „krški mramor" (njem. Karstmarmor) nalazi svoju primjenu u brojnim bečkim javnim i privatnim zgradama. U privatnim kućama koristi se za izradu stepenica i podova, a u javnim prostorima vapnenci se često rabe kao materijal za izradu kipova i ukrasnih elemenata.

Kada je riječ o austrijskom kulturom blagu, najvažniji izvor informacija o njegovoj mineralnoj (kamenoj) građi djelo je geologa Aloisa Kieslingera (1900.–1975.). Kieslingerova iscrpna knjiga o austrijskim građevnim i dekorativnim vrstama kamena, kao i brojni članci o svojstvima i načinima propadanja kamenog materijala, među najcitiranijim su izvorima u austrijskoj stručnoj i znanstvenoj literaturi koja se odnosi na očuvanje arhitektonske baštine i konzervaciju kamena. Uz pisanu ostavštinu, Kieslinger je za sobom ostavio i bogatu zbirku građevnih i ukrasnih vrsta kamena iz različitih dijelova Europe, s naglaskom na bivše austro-ugarske zemlje.

Na temelju Kieslingerovoga rada i njegove ostavštine, na povijesnim bečkim građevinama mogu se prepoznati različiti varijeteti krškog vapnenca. Identifikacijom pojedinih od njih na licu mjesta, bilo je stoga moguće dokumentirati obradu takvih površina i odrediti očuvanost svake od njih. Također, u članku je obraćena pozornost, koja uključuje i petrografsko ispitivanje, na neke od najvažnijih tipova vapnenca iz Kieslingerove zbirke.