Confirming archaeological excavation results with ground penetrating radar: The main courtyard of Corvin Castle

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I. HISTORICAL CONTEXT & MOTIVATION

Corvin Castle (variously known as Hunyadi Castle or Hunedoara Castel, Castelul Corvinilor (Romanian) or Vajdahunyadi vár (Hungarian) is a castle that sits atop a hill in central Romania (Hunedoara County). Its medieval portion was constructed on the site of a 14th century stone fortress (Bogdan 1970) by Ioan Hunedoara (John Hunyadi) in the first half of the 15th century. Significant building campaigns were later carried out by Mattias Corvinus (15th c), Gabriel Bethlen (17th c), and a variety of imaginative 19th century architects (Velescu 1961), all further reimagined by poorly documented 20th century archaeological and restorative campaigns. Upcoming restorations prompted an extensive survey of the castle's older Southern half, including the enigmatic central courtyard, to better understand the current state of construction (see Morris et al 2018).

Central Courtyard

The courtyard contains the highest concentration of features from the original stone fortress, including doorframes and stone blocks (Vatasianu 1933, Bogdan 1970). In the 17th century, it was home to an administrative or housing complex during the extensive construction of the northern wing. At present, the courtyard is covered in an uneven layer of fine silty soil (nominally less than 20 cm) on bedrock, which is visible over about one third of the courtyard surface. The precise geology is unknown, though the underlying outcrop is most likely composed of metamorphic schists and dolomite (Földvary 1988).

II. DATA COLLECTION

500 MHz Sensors & Software Noggin with DVL, Smart Tow/Rough Terrain configuration

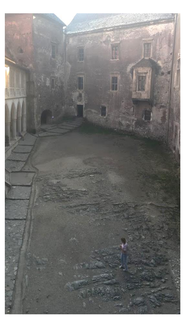
Grid collected in two directions at 50 cm line spacing, bounded by modern paving (eastern edges) and rough exposed bedrock (northern edge)

III. PROCESSING & ANALYSIS

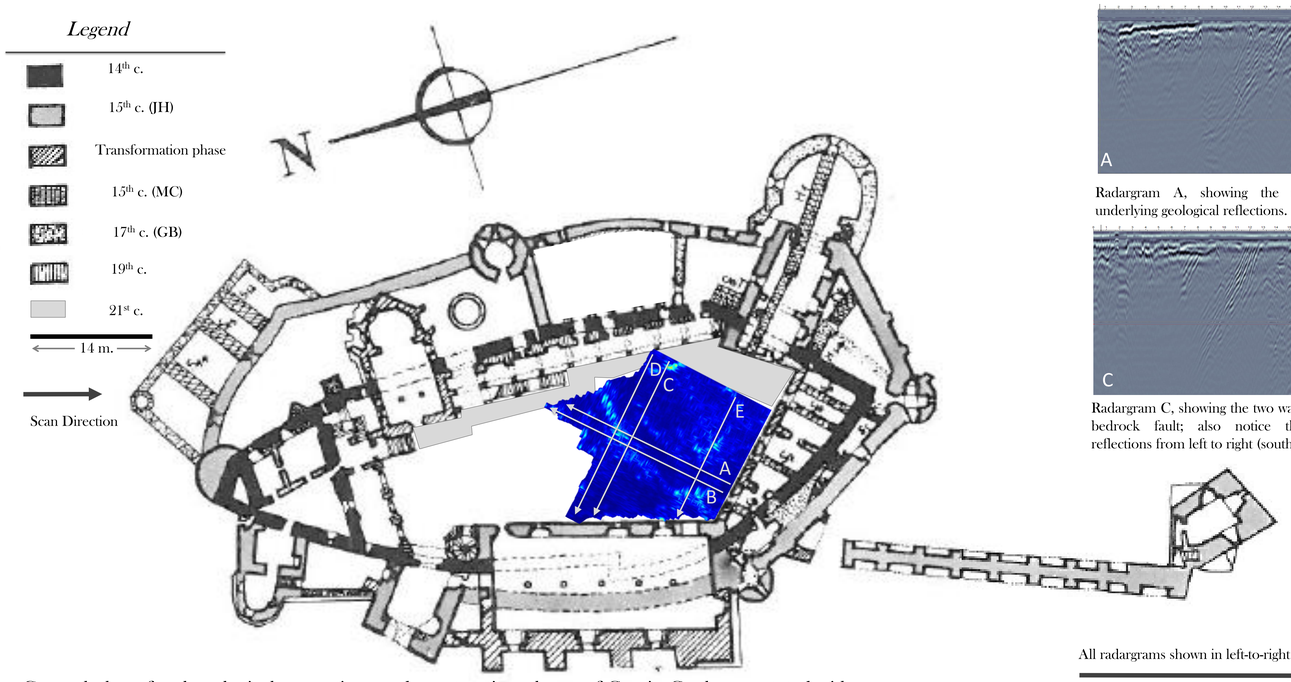
Basic radargram processing: total background removal (except as noted by ǂ); depths shown in ns; horizontal axis in meters; SEC gain; dewow

Depth slice processing: 10 cm slice resolution; amplitude dewow, migration, and envelope filters; SEC gain
Minimal display adjustments to contrast and sensitivity

A velocity of 0.1 m/ns may be used for depth estimates



IV. COURTYARD RESULTS

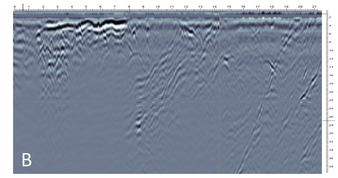


General plan of archaeological excavations and construction phases of Corvin Castle, annotated with approximate locations of selected radargrams (Bogdan 1970).

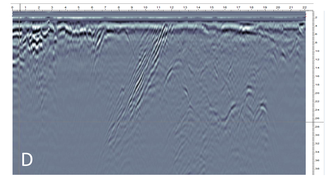
Radargram A, showing the two walls and underlying geological reflections.

Radargram C, showing the two walls and possible bedrock fault; also notice the change in reflections from left to right (south to north)

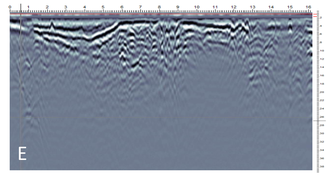
All radargrams shown in left-to-right direction (m)



Radargram B, showing the two walls and possible bedrock fault; also notice the shift in the character of the reflections from left to right, passing the boundary as marked in the plan.

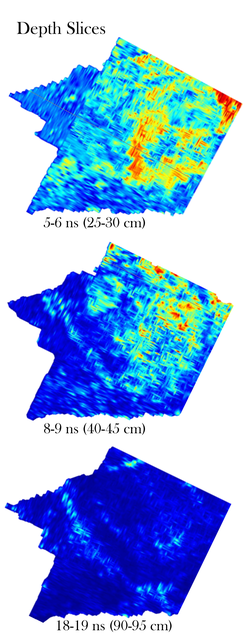


Radargram D showing the major northern-most wall and possible fault in bedrock; this scan also includes the paving along the eastern corner

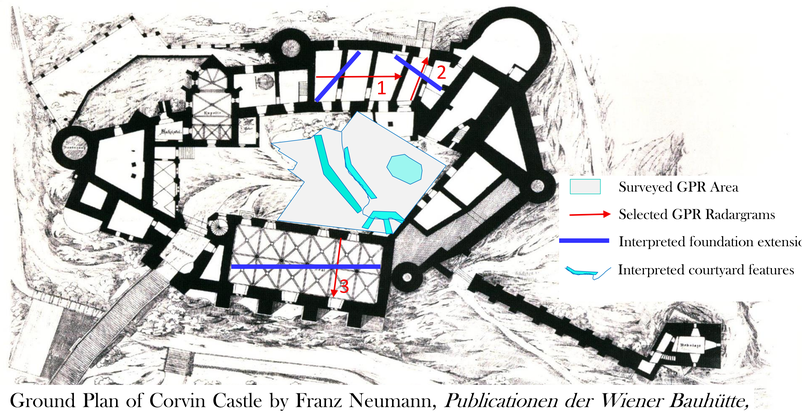


Radargram E showing section of elliptic feature and other representative reflections

V. CONCLUSIONS



Orientation for foundation radargrams



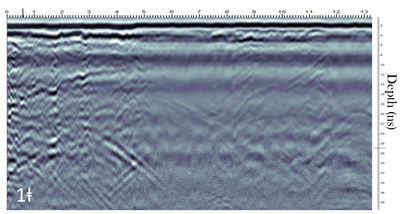
Ground Plan of Corvin Castle by Franz Neumann, *Publicationen der Wiener Bauhütte, Jg. VI.2, plates 13-14* from the University of Vienna Archives, annotated with features identified using GPR.

GPR provides additional information about underlying geological conditions and features in bedrock topology, confirming metamorphic origins and folding patterns.

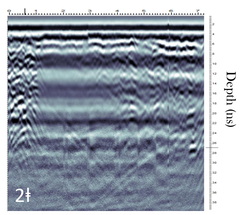
Bedrock reflections in courtyard provide a reference from which the foundations in the surrounding castle can be interpreted, confirming the transition from bedrock foundations to built-up foundations around the perimeter of the castle.

In the courtyard, GPR can identify various walls and other structures which are most likely associated with the 17th century administrative complex, with some features belonging to earlier phases of construction and use (as in the western corner).

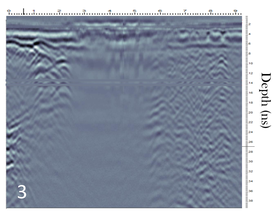
In general, geophysical investigation provides insight into the construction and evolution of the castle, confirms historical accounts of expansion, and reveals novel details about previous features.



Radargram 1 showing interpreted foundation extensions in the Lapidarium



Radargram 2 showing interpreted foundation extensions in the Bucătăria Nobiliară



Radargram 3 showing interpreted foundation extensions in the Sala Cavalerilor

Bogdan, A. *Contribuţii arheologice la cunoaşterea evoluţiei Castelului Corvineştilor de la Hunedoara.* Buletinul Monumentelor Istorice 1970, 2, 19-25.
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Vatasianu, V. *Castelul Corvinilor din Hunedoara.* Boabe de Grau, *An IV* **1933**, *6*, 420-431.
O. Velescu, *Castelul de la Hunedoara.* Bucuresti, 1961.
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Földvary, G.Z. *Geology of the Carpathians.* Singapore, 1988.

The data used in this study were collected during ArchaeoTek's Advanced and Applied Field Geophysics Workshop in 2017 and is used with permission. The complete GPR survey and associated results are presented in Morris et al. (in preparation).