Keynote: Belowthesurface

Archaeology of the river Amstel in Amsterdam during the North/Southline metro construction and its analogue and digital spinoff

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Abstract: Between 2003 and 2009 several archaeological excavations have been organized during the construction of the new North/Southline metro in Amsterdam. The basic theme of the research was a new urban material history, based on the large quantity of finds (c. 700,000) which were recovered from the former riverbed at Rokin and Damrak in the centre of the city where the metro was built. The river is analysed and interpreted as a new source of archaeological data on urban life from 1200 until the present day. The archaeological data created by the river provides, through its spatial context, new perspectives on the material interpretation of the city's history. The methods and outcome of this city archaeology project are discussed together with its analogue and digital products, such as, the photo atlas *Stuff* with 13,000 finds, the public display of 10,000 finds in two showcases in Station Rokin and the website Belowthesurface.amsterdam with 20,000 finds.

Keywords: *Amsterdam—metro—river archaeology—digital archaeology—website*

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Metro

The North/South line is a 9.7 km metro connection between the north and south of Amsterdam, which is separated by the IJ, the ancient harbour in front of the historical town. The 7.1 km long underground route in the historic city centre where possible followed the existing open infrastructure to avoid damaging buildings. The open spaces in the centre consist of streets but also of (partly open and partly filled in) waterways (Fig. 1).

The tunnels were drilled at a depth of 20 to 30 metres, below NAP (Amsterdam Ordnance Datum defining the city's normal water level), and below the wooden foundation piles of the buildings next to the metro route, which are at an average of 12 metres below NAP. From a civil engineering point of view, the building project was highly innovative and even experimental, as at the time, there was no previous experience of boring tunnels through a soft subsoil of sand and clay in a historic city centre like Amsterdam.

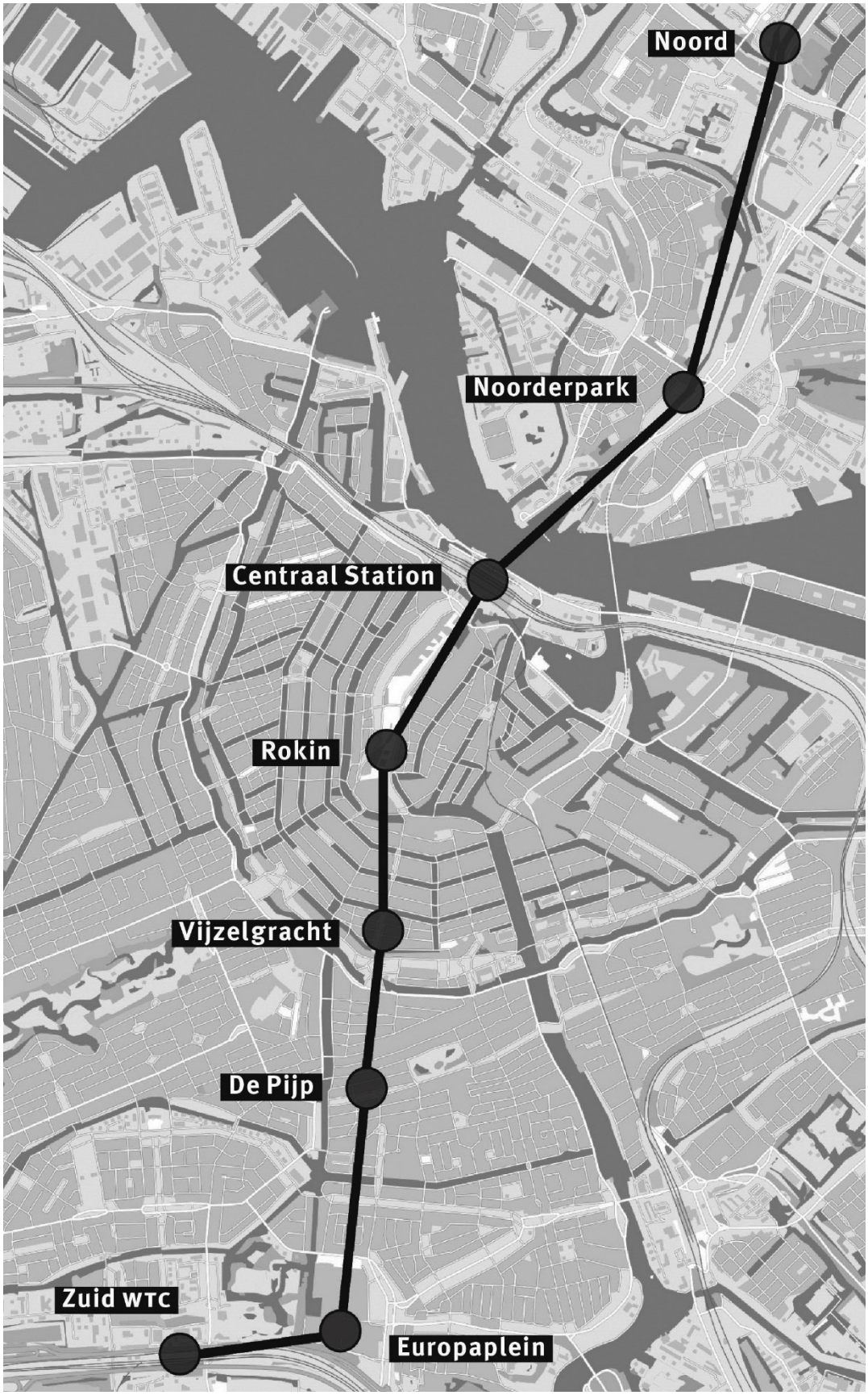


Fig. 1. Route of the North/Soutline metro. The Damrak building site is part of Station Centraal Station, situated together with rokin and Vijzelgracht in the historical centre of Amsterdam (Gawronski et al. 2018, p. 12: design Willem van Zoetendaal)

The challenges of the North/South line were not confined to civil engineering, but applied equally to archaeological research, which was organised by the office of Monuments and Archaeology of the city of Amsterdam and formed an integral part of the construction programme. The archaeological implications for the construction sites in the city centre were assessed in the early stages of planning. The tunnel itself was not the primary archaeological site, as is it was technically impossible for archaeologists to work ahead of the tunnel boring machine. The tunnel cuts through different levels from several landscape periods dating from 124,000 to 10,000 BC (the geological epoch of the late Pleistocene). Between roughly 12 and 25 metres below NAP the soil layers belong to a steppe landscape (Weichselian or the last Ice Age period, c. 114,000–10,000 BC) and from approximately 25 metres below NAP the shores of a warm sea, the Eemian Sea (Eemian, c. 124,000–114,000 BC). The archaeological research focused on the soil layers in the upper 12 metres of the six vertical excavation pits for the stations along the route, belonging to the Holocene epoch (10,000 BC till present).

River archaeology

Four of the six construction sites which were selected for archaeology were situated in former or existing streambeds (Stationsplein, Damrak, Rokin and Vijzelgracht). The two main sites were Damrak and Rokin, which yielded 99 % of all finds (Fig. 2).

These sites make the archaeological project of the North/South line essentially a river archaeology project, involving a systematic examination of the bed of the River Amstel (Gawronski et al., 2010). Streambeds had significant archaeological potential because of the simple fact that material remains can sink to the bottom of rivers, canals or open water and can accumulate in large quantities over time, depending on the degree of dynamics of the water environment (current, sedimentation etc).

Archaeologists were first alerted to the research potential of streambeds by the nascent discipline of underwater archaeology in the 1960's. The upsurge of finds and discoveries from lakes, rivers, canals and their banks raised general awareness of the scientific value of streambeds as repositories of archaeological finds, while excavations of reclaimed waterways and harbours served to strengthen this idea. In Amsterdam several excavations have demonstrated the archaeological potential of landfilled banks (Jayasena, 2020). Elsewhere, recent metro construction projects that transected water zones have yielded a plethora of deposits, such as the excavations of the Byzantine Harbour of Theodosius in Istanbul during the construction of Yenikapi metro station in 2004–2013 (Kocabaş, 2015), or those of the Roman harbour in the Rhine in Cologne while building the Nord-Süd Bahn in 2003–2012. The special archaeological nature of banks and underwater sites has not only been recognised by science, but even in art. Of significance is Mark Dion's *Tate Thames Dig* in 1999. Dion used the banks of the River Thames in London as a backdrop for an archaeological installation by collecting finds there at low tide, thereby representing the river as a material source (Coles et al., 1999).

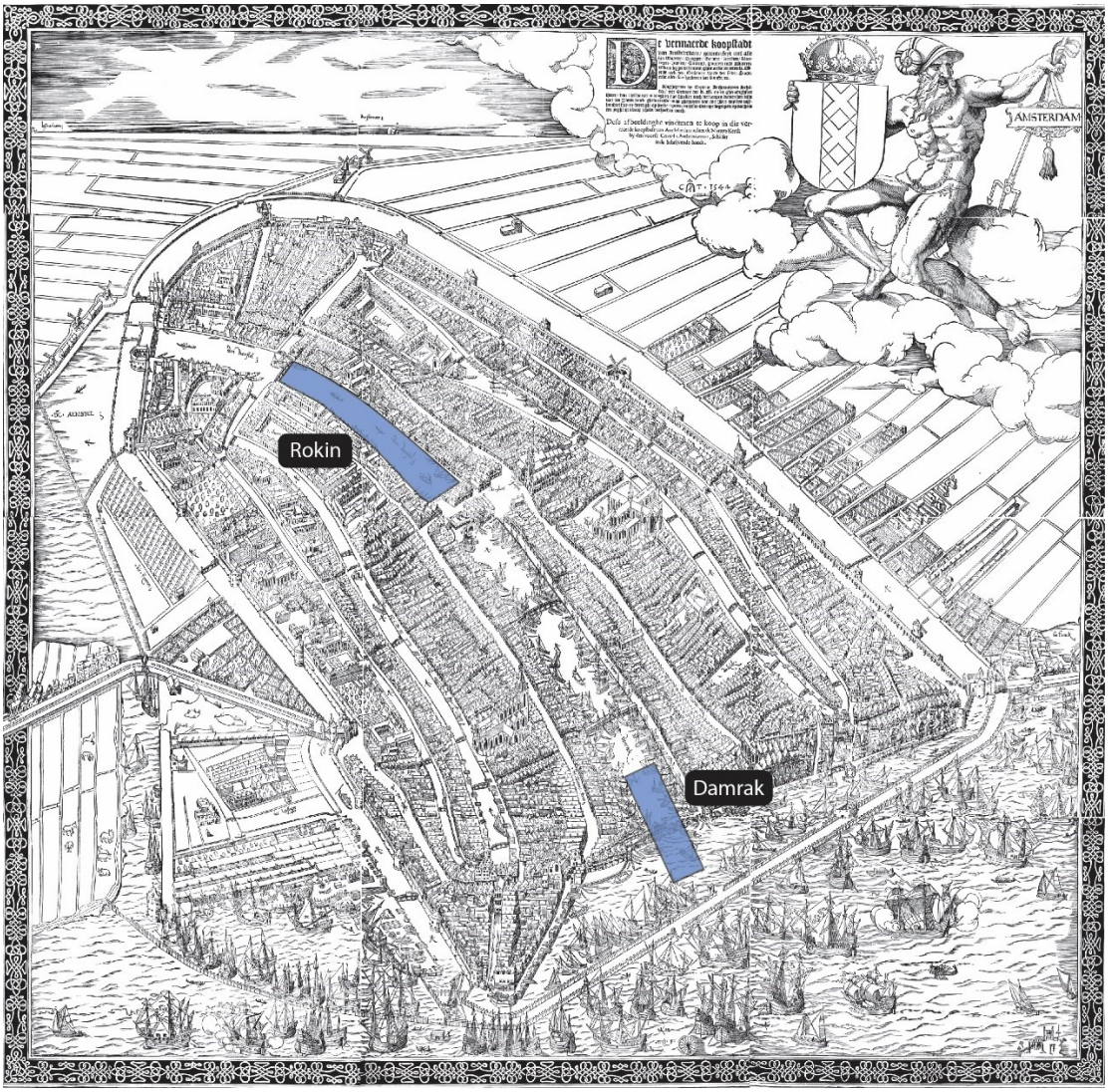


Fig. 2. Historical map of Amsterdam by Amsterdam by Cornelis Anthonisz from 1544 with the River Amstel as the vital artery of the city (Amsterdam City Archives, 010001001032). The tunnel of the North/South line follows the open waterway of the Amstel in the historical city centre and the construction sites of Damrak and Rokin are situated in the riverbed (Gawronski et al. 2018, p. 14: design Willem van Zoetendaal)

By far the largest group of archaeological finds from these riverbed sites is linked to a universal aspect of human behaviour, namely the habit of dumping waste in water. It is an easy way of getting rid of waste, as it immediately disappears out of sight or is carried away by the current. This waste, specifically in an urban setting, can be extremely varied, of both domestic and artisanal or industrial origin. As such, it can be spatially related to activities which are associated with a building or structure, workshop or installation along the bank**.** Apart from archaeological remains which are connected with activities ashore, there is also a category of water finds which are primarily associated with shipping activities that vary from items that have fallen overboard, to complete shipwrecks and parts of ships. Yet another group consists of items, mostly personal belongings, that were not dumped intentionally but were somehow lost accidentally in the water.

Apart from the physical aspect of archaeological material sinking down in water, underwater deposits differ from deposits on land, in the diverse origin and generally mixed nature of the finds. The chance of finding concentrations of material remains is highest in the beds of urban canals due to high

habitation density and the frequency with which inhabitants and workshops discarded their unwanted 'stuff' in the water. In a water-rich city such as Amsterdam, this was certainly the case. The city's many historical rulings on the disposal of waste in waterways go back as far as the fifteenth century and clearly attest to the widespread practice of this illegal form of waste disposal and the difficulty in curbing it.

Fieldwork on Damrak and Rokin

Different techniques were applied in the archaeological fieldwork to retrieve as many finds as possible during the civil engineering operations. Archaeology had to be integrated in the building process, which was large scale, complex and technologically advanced. Depending on the specific building scheme a certain archaeological solution was chosen. On Damrak for example the construction process involved sinking a concrete caisson of approximately 60 × 20 metres, constructed in the existing open water on the bed of the Damrak, to a depth of 25 metres. The civil engineering excavation process consisted of liquefying the soil beneath the caisson with high-pressure water cannons with water and pumping the mixture of soil and water through tubes to a discarding system. The working chamber beneath the caisson was kept pressurised to keep out the groundwater. The pressurisation limited the working time underneath the caisson for construction workers and archaeologists alike.

The on site archaeological documentation was achieved by accompanying each jetty engineering team by an archaeologist, and having a separate team of archaeologists worked in the evening at the end of sinking operations to document in detail the finds and underground soil context. In order to guarantee the maximum retrieval of finds while jetting operations were in progress, a large size industrial sieve was connected to the drain pipes. The sieve had two decks with different sized mesh (upper deck 4 × 4 cm, lower deck 1 × 1 cm) that caught any finds larger than a centimetre from the ejected slurry. A separate team of archaeologists operated the sieve and managed to gather 465,536 finds (43,045 records in the find database), originating from an excavation area of only 60 × 20 metres and c. 12 metres deep (the underside of the riverbed).

The Rokin building site consisted of a box like structure of deep walls (30 metres deep), measuring 190 × 25 metres, for the underground station. The entire space had to be excavated to reach the future metro platform level, at a depth of 27 meters below NAP, where the tunnel drill would enter the station. The excavation was executed in five 3-month phases. During each phase a 4–5-metre-high layer of soil was removed over the whole length of the pit from south to north. At a soil depot an archaeological team sifted through the soil for finds, looking especially for small metal finds using metal detectors. The archaeological operation on site concentrated on the first 3 phases of excavation, as the riverbed of the Amstel on the Rokin had an estimated depth of 12 metres. The richest find deposits in the river were uncovered during the excavation to approximately 6.5 metres below NAP related to soil deposition from the 16th to the 19th century. The stratigraphic position and depth of the finds in the different layers were documented with over 100 cross-section drawings of the Amstel fill. The horizontal distribution of the finds was recorded using a grid system which was linked with the actual building layout on the banks on either side of the river. By integrating the geological stratigraphy and the finds distribution in a 3D GIS, the archaeological finds could be linked to their provenance inside the river and to historical buildings on either side of the Rokin. The archaeological research at Rokin ultimately yielded 229,943 finds (90,258 records in the find database).

Processing the finds

Altogether a total of 697,235 archaeological finds were retrieved from the six sites (Table 1). This included complete objects and numerous fragments. These are documented in 134,282 individual records in a digital relational database which is compiled from multiple separate data tables. Each record consists of a number of fields in which the separate attributes of a find are recorded, each based on a specific data table.

Site	Number of finds	%	Number of records	Total weight (gr)
Damrak NZD1	465,536	667	43,045	8,010,552
Rokin NZR1 and NZR2	229,943	33	90,258	13,347,833
Other sites	1,756	03	979	344,719
Total	697,235	100	134,282	21,703,104

Table 1. The total number of archaeological finds from Damrak, Rokin and other sites of the North/South line project, including the number of records in the database and the total weight of the finds (Gawronski et al. 2018, p. 20: design Willem van Zoetendaal)

In principle, one record contains two categories of information: fieldwork data and object data. Fieldwork data is practical and concerns for instance, the date on which the find was made or the location within the excavation, such as in which layer or at which depth (stratigraphic indication), or where in the horizontal section. Object data is more varied and relates in the first place to the perceived attributes of a find, such as its dimensions, material, production method, type of decoration (important for differentiating pottery, for example), the number of fragments or parts within a record (sherds of a single pot, for instance) or the extent to which an object is complete. A second group of object data is derived from specialist interpretation. This extrinsic data concerns the find's functional, chronological and spatial attributes (Gawronski, 2012, pp. 8–13). Functional data records what an object was used for. A functional reconstruction of the find is one of the primary goals of artefact studies. These functional interpretations may vary in complexity. The most basic functional meaning is to define the purpose of the complete original object as archaeological finds in general are broken and consist of fragments. So when a find consists of the foot of a vase, the function of the object is given as 'vase' and not 'foot'. A second functional meaning is linked to the broader context in which the artefact was used, for instance a household item. These functional features serve to create larger categories of finds. To the functional feature meaning, the chronology of the find can be added. The chronological attribute is determined by the year or time period when it was made or used. A date can be deduced from the object itself because it is representative of a certain type from a certain period, or from its relation with other finds of known date, which thus provide a relational chronology. The spatial non-fieldwork features relate to the location where the object was made or in case of import, its place of origin, which in turn can be linked with the type of material and the production technique. This applies in particular to pottery; for example, if the material is porcelain the place of origin could be China.

Damrak and Rokin data

The finds data can be used to compare both sites, which are each situated in a different topographical river context: Damrak at the mouth of the River Amstel and Rokin in the river section in the urban

heart of Amsterdam. An initial distinction can be made on numerical grounds: the yield of 465,536 finds from the riverbed at Damrak is double that of the 229,943 finds from the entire excavation at Rokin, which constitute respectively 66.7 % and 33 % of the total yield from all the research sites put together. Comparison of the types of material reveals a similar picture of the type of objects—waste—that were disposed of in the river at both locations (Table 2).

The bulk of the finds in both cases consist of ceramics (350,491), followed by bone (126,367), metal (91,849), leather (58,597), clay pipe (26,225), glass (21,218) and building ceramics (10,405). There were very few finds in any of the other categories. However, there were also differences between them. Although there were half as many finds at Rokin, the average weight per find at Rokin was 3.5 times greater than that of the Damrak finds. The difference in weight indicates that the finds at Damrak were more fragmented. These simple comparisons of quantity and weight offer an initial indication of the different waste disposal practices at the two locations: at the mouth of the river the disposal of bulk waste and in the city centre the disposal of complete household items. Another factor determining the statistical outcome is the collection method. The sieve with the 1 × 1cm mesh yielded a comparatively large number of small finds, including a relatively large number of virtually indestructible metal objects.

Category	Damrak number of finds	Damrak number of records	Damrak weight (gr)	Rokin number of finds	Rokin number of records	Rokin weight (gr)
CER (ceramics)	201,823	16,947	3,326,919	148,668	50,334	8,581,922
FAU (fauna)	111,198	4,538	2,889,223	15,169	3,948	947,878
MTL (metal)	74,867	10,308	1,221,127	16,982	14,556	834,118
LEE (leather)	45,775	2,278	2,939	12,822	5,255	6,451
CPY (pipe clay)	15,088	3,239	898	11,137	6,382	3,195
GLS (glass)	7,586	1,674	88,389	13,632	4,971	784,453
BWM (building ceramics)	2,494	880	133,788	7,911	2,949	971,760
HT (wood)	1,175	985	167,714	810	627	25,925
KSC (clay sculpture)	120	120	2,196	7	6	383
KST (synthetics)	641	369	7,697	51	42	2,320
PLT (botanical)	1,790	270	5,064	536	166	4,483
STN (stone)	1,032	514	110,317	1,468	437	1,133,720
TW (rope)	73	51	326	133	101	2,791
TXT (textile)	753	585	10,895	389	289	2,162
VST (flint)	549	137	27,702	1	1	11
Other	572	150	15,358	227	194	46,261
Total	465,536	43,045	8,010,552	229,943	90,258	13,347,833

Table 2. Distribution of the finds from Damrak and Rokin per material category (Gawronski et al. 2018, p. 22: design Willem van Zoetendaal)

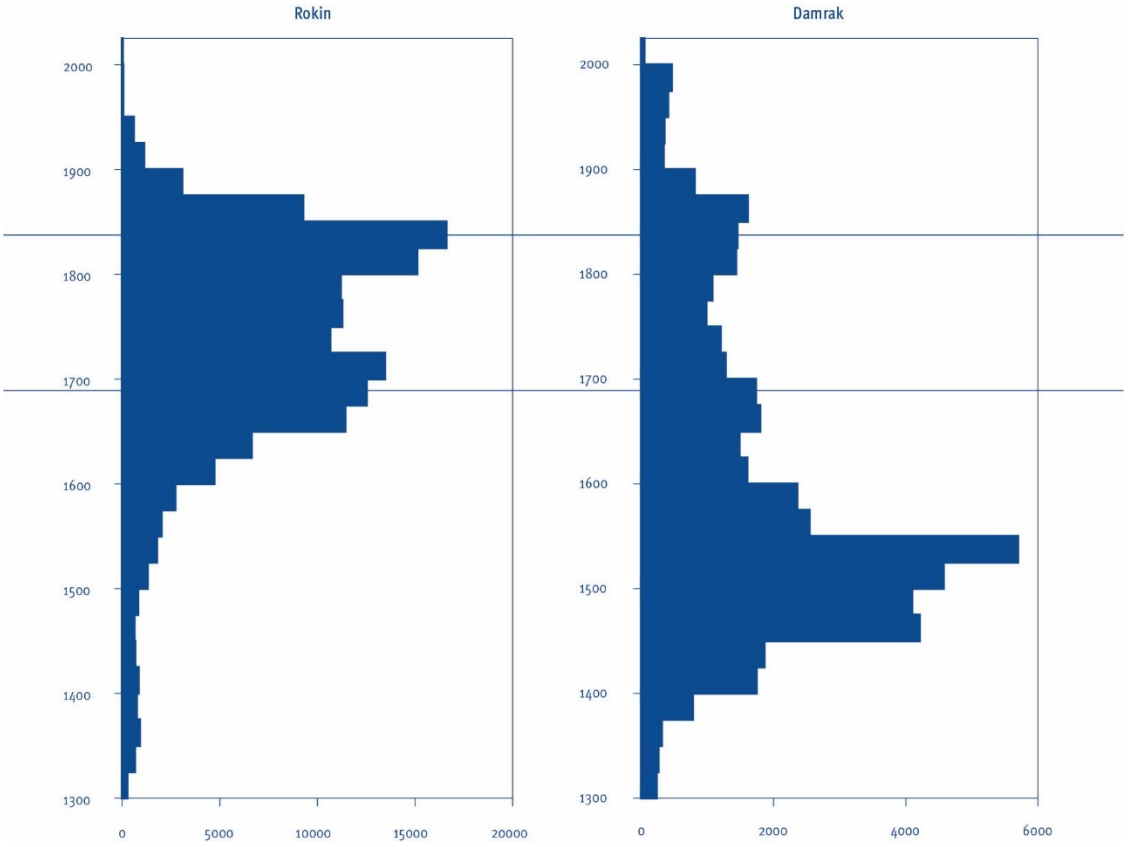
Regarding the dating of the finds, both sites share as a common feature a long term almost continuous chronology. As Rokin was filled in in 1937 and Damrak was still open water during the

excavation in 2005, the finds from the river in its urban context at these two locations date not only from the medieval and early modern period, but are also related to the modern era, linking urban material culture from a historic context to the present day (Fig. 3).

Fig. 3. Ceramics from Damrak and Rokin, dating from the 14th to the 20th century (photo: City of Amsterdam, Monuments and Archaeology)

At the same time, the two sites show striking find dating differences. The chronological data shows that the bulk of the Damrak material dates from 1450 to 1600 (Graph 1).

The peak in the first half of the 16th century can be put down to the construction in the first quarter of that century of a land abutment for the 'Nieuwe Brug' (New Bridge), which was filled with urban waste. This bridge connected the eastern and western banks of the mouth of the Amstel at Damrak and was first mentioned in 1365 but was built at an earlier date (Gawronski, 2012, p. 30). Originally of wood, the bridge was fitted with stone arches around 1529 on the west side, keeping its span of wooden piers at the eastern end certainly until well into the 17th century. Another factor that affected the chronology of the finds is the construction of the massive wooden floor of the lock in 1681, sealing the streambed beneath the bridge. The Rokin finds, on the other hand, mainly date from the period 1650–1850. The more recent dating can be attributed largely to the dredging operations carried out from 1600 to maintain water levels for shipping, which cleared the waterways of material remains from earlier periods. Thus, the two sites give a further insight into the city's material culture in these eras. Despite their different dating, the two locations show the same pattern between 1600 and 1900, with a similar (slight) peak around 1650–1725 and 1800–1875. This dating pattern may well mirror major economic cycles, such as the blossoming of trade and the city in the 17th century, stagnation and decline in the 18th century, and the renewed opportunity and growth brought by the industrial revolution in the 19th century.



Graph 1. Distribution in blocks of 25 years of the dated finds from Damrak and Rokin (Gawronski et al. 2018, p. 22: design Willem van Zoetendaal)

3D GIS of the Rokin

In addition to numerical and statistical analyses, the spatial distribution of the finds provided further evidence for a reconstruction of activities at Damrak and Rokin and the functional significance of these locations within the city's topography. To focus on Rokin, in the processing of the finds from this site new techniques were used to transform the excavated riverbed into a source of urban histories. Software in the form of GIS (Geographic Information System) was used to develop a 3D GIS-model of the geological structure of the riverbed (Fig. 4). For this over one hundred cross-sections of the river, which had been mapped over the entire length of the excavation site, were digitised and combined. Two-dimensional data, such as historical maps and other digitised information, was also imported into this three-dimensional model. Even though the finds had no exact XYZ-coordinates, they could still be incorporated into the model using their position in the grid or soil layer. The integration of different data sets and map layers opened up new possibilities for working with complex archaeological and geological data.

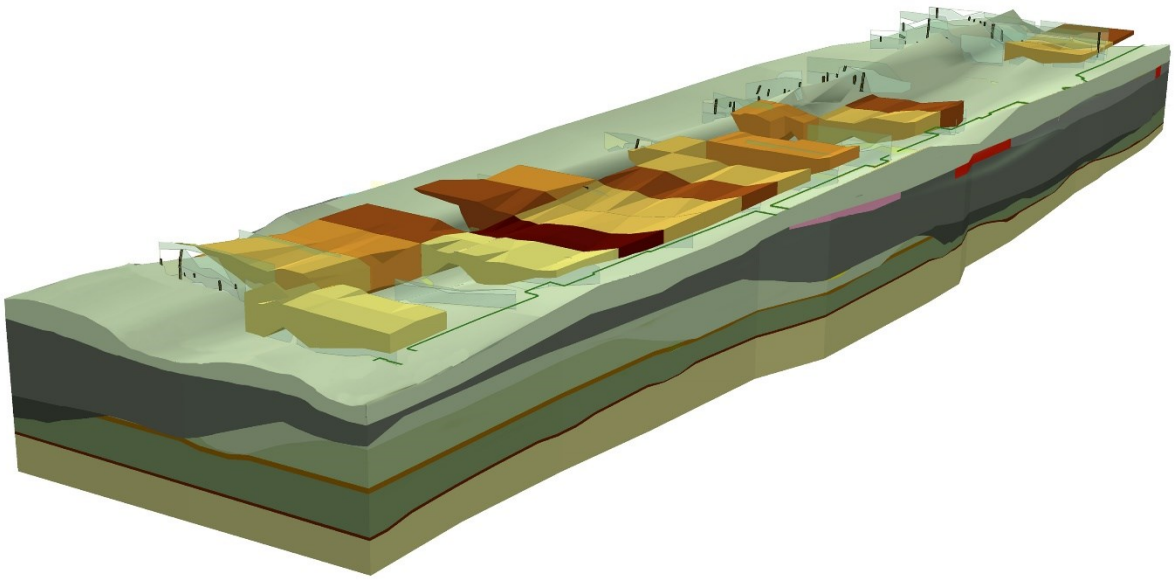


Fig. 4. 3D GIS-model of the geological structure and archaeological content of the riverbed of the Amstel at Rokin (3D GIS: City of Amsterdam, Monuments and Archaeology; Jort Maas, Bart Vissers)

In effect, the model turned the riverbed as a whole into a queryable database on the spatial distribution of the finds and their functional relations. With the 3D GIS-model it is possible to plot variation in find distributions using cartographic representations, and in this way document (changes in) the use of space along the riverbank. The similarities as well as the differences between the spatial find patterns can indicate that certain functional find groups correspond with certain activity areas, providing the basis for the reconstruction of a story about past urban life. A practical example of this theoretical distribution principle provides the different distribution of sherds of sugar funnels and syrup jugs, both of which were made of the same red earthenware (redware) but which were functionally different (Fig. 5). The funnels were exclusively used in the sugar refining process whereas the syrup jugs are thought to have been involved with distribution and consumption of syrup, a residual product of sugar fabrication from sugar molasses. This functional difference is reflected in their two different spatial concentration patterns, pointing to a possible association with activities in certain parcels along the river. In the case of the sugar funnels this pattern can be historically substantiated, for it can be traced back to the premises of the confectionery establishment ‘De Drie Suikerbroden’ (The Three Sugar Loaves) on parcels 87–89 along Rokin. The sugar factory was founded in 1611 by the Hamburg emigrant Hans Pelt and after extending the business to parcels 81–85 in 1651, he continued to operate under the name ‘De Vier Suikerbroden’ (The Four Sugar Loaves) until 1842 (Alings, 1964). Two and a half centuries later, the sugar funnel finds attest to the disposal of industrial waste right in front of the building on Rokin. This pattern clearly indicates that, despite soil disturbances that can be expected of an urban river, spatial relations between finds and activity areas can still be identified. The concentration of syrup jugs farther along the riverbank raises the question of whether this could point to a historically unknown sales or distribution point.

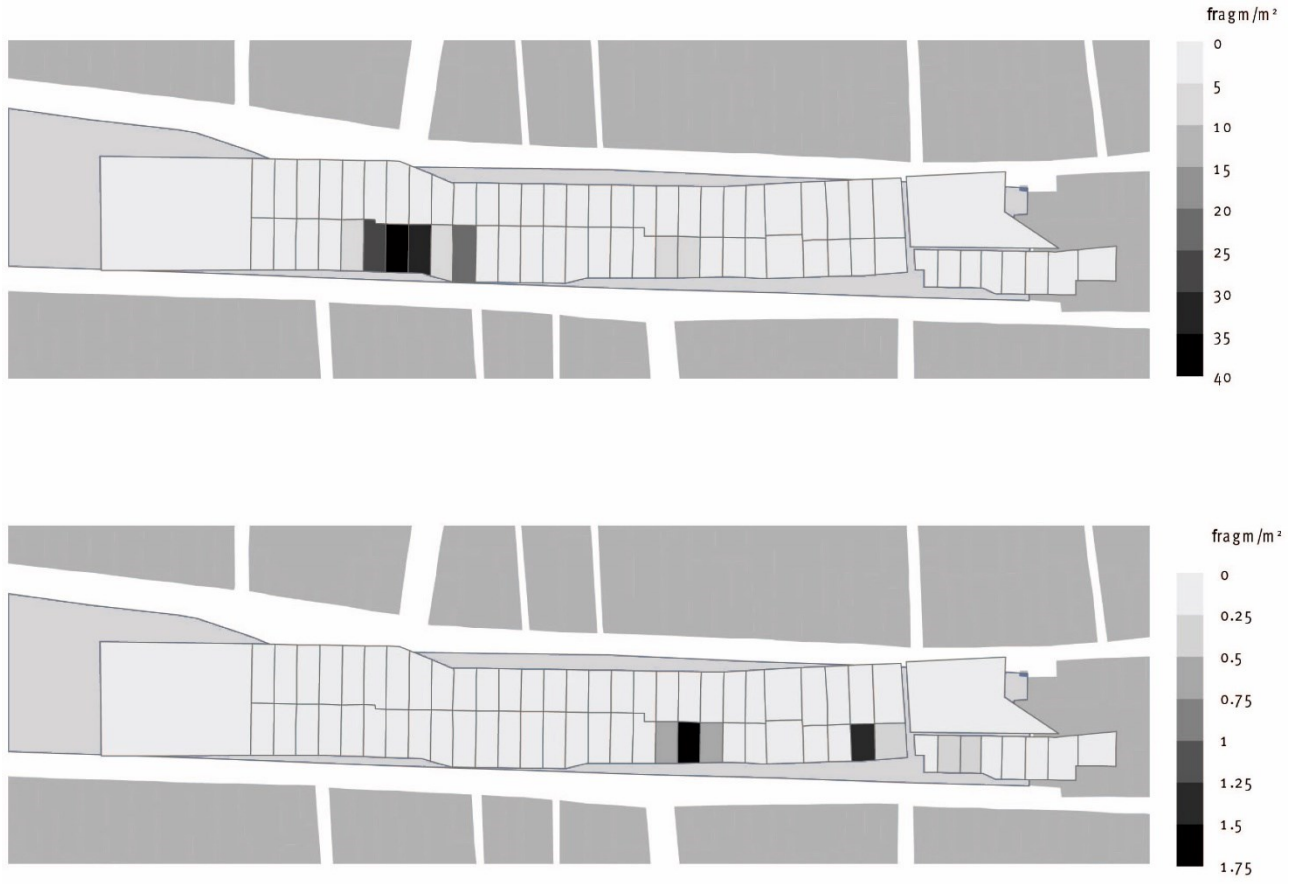


Fig. 5. Distribution on the Rokin of sugar jars (top) (concentration in front of sugar factory) and syrup jugs (bottom) (map: City of Amsterdam, Monuments and Archaeology; Jort Maas, Bart Vissers)

Urban classification

In view of the great potential of the Damrak and Rokin finds for urban story-telling a classification scheme was developed through which the varied finds from the riverbed would reflect the city as an entity. As discussed, cataloguing of archaeological remains is based on the selection of one specific feature of a find from the database. Which criterion is selected and what meaning is given is for the archaeologist to decide. Ultimately, archaeological meaning is a subjective perception even though it is based on calculated and objective information. This applies even more so to an archaeological catalogue, since it entails by definition a selective arrangement of the finds. The central structure of a catalogue can only be based on one criterion or attribute at a time. Various catalogue systems exist. For instance, to convey an era, the objects can be presented chronologically, or, for a spatial presentation, arranged according to where they were produced or how they were distributed at the site. Archaeological catalogues tend to be functional overviews in which the objects are grouped according to their function or purpose, very often in conjunction with the material they are made of.

The ambition of the classification of the Damrak and Rokin finds was to turn the riverbed of the Amstel into a material mirror of the city, analogous to the river's water surface which reflects the city structures along its bank on a calm windless day. Therefore, a classification of material remains was developed around the functional, spatial, logistical, economic and cultural characteristics that typify an urban centre. A city sets itself apart from the country and non-urban communities in the scale and diversity with which these characteristics are given expression. A city such as Amsterdam can be

broken down into ten main functional features which were added to the finds database for an urban ordering of the archaeological remains. This ordering structure is based on classifications used for large museum collections, and these in turn are based on the assumption that every artefact originally assumed a specific role and place in the interaction between man and his surroundings (Chenhall, 1988). Through their individual functional properties the objects can be allocated to one of ten main urban categories of the overall classification system. The ten urban categories are (Gawronski et al., 2018, pp. 27–28):

1. Buildings & structures: the city is a spatial phenomenon with a built environment that is shaped by the constructed amenities of urban life, such as city walls, churches, hospitals and theatres.
2. Interiors & accessories: the city provides a living environment which is reflected in the furnishings of interiors, including furniture and permanent fixtures.
3. Distribution & transport: the city functions as an infrastructural junction for the transportation of goods and people by water, land and air.
4. Craft & industry: the city is a centre of multifarious production with the capacity to upscale from an artisanal to an industrial level.
5. Food processing & consumption: the city is a subsistence environment where people provide for their daily needs themselves.
6. Science & technology: the city is a centre of knowledge serving the advancement of science and technology.
7. Arms & armour: the city provides citizens with a safe environment, generally in tandem with law enforcement and the use of arms.
8. Communication & exchange: the city is an environment conducive to the exchange of ideas, goods and news. This is what sets urban culture apart. Social and cultural processes in such diverse areas as information transfer, religion, art, monetary transactions and (product) quality guarantee fall into this category.
9. Games & recreation: the city is an environment where people relax and enjoy free time.
10. Personal artefacts & clothing: the city is a place made up of individuals with both a private life and a life as a member of the urban community. Anything that distinguishes a person as an individual, from prostheses to jewellery, falls into this category.

Photo atlas *Stuff*

The urban classification system was used as the basis for different products to present the archaeological finds in varying settings and contexts. The first was a printed find catalogue, the more conventional spinoff of archaeological practice.

The find collection amounted to a total of 665,412 objects. In approximately 73 % of the finds (482,502 objects), the significance could be traced to a (pre-)urban context. Each prototype or each series of similar but individual objects among these finds are reproduced in this catalogue, titled *Stuff*, in 11,279 photographs (Gawronski et al., 2018). The challenge was to make the results of the

archaeological excavations visually accessible. While the scientific ordering system supplied by the archaeologists was the starting point of the catalogue, the visual experience was realised by the layout of the designer and photographer. *Stuff* distinguishes itself from mainstream archaeological catalogues because of the close cooperation between archaeologist, photographer, designer and printer. A trustful cooperation in which each discipline had its own equal say resulted in a visual strong experience, telling a story of material sequences of urban life by serial images of finds.

At first glance, *Stuff* is a never-ending stream of different, more or less recognisable objects that invites us to browse and explore our own associations and reconstructions. But behind the cascading images lies an archaeological story that gradually emerges out of the visual structure, creating an atlas instead of a conventional catalogue, thanks to Willem van Zoetendaal's lucid and seductive design. The photographs tell their own story, prompted not by text but by their arrangement in chapters and sections according to the different functions that a city fulfils as a living organism. The material remains are primarily organised according to the role the object once assumed within these different urban functions. The finds derive their significance from the functional and chronological relation with the city assigned to them in the catalogue. Basic catalogue information, like find number, size and dating, was allocated to each find in a vertical bar left of the object photo, contributing to an object waterfall-like design grid which made this large quantity of visual information accessible (Fig. 6). Each singular image had a powerful visual effect because of the unmatched eye for detail, colour and texture of photographer Harold Strak, who documented more than 20,000 finds during the project. To underline the basic practice of archaeologists who by excavating do nothing less than reading the book of the earth, the printer (Rob Stolk, Amsterdam) used custom-made paper with a semi transparent effect, showing the contours of the finds on the next pages, simulating find layers in the underground.

Fig. 6. Spread of two pages from chapter Communication and Exchange of photo atlas Stuff (Gawronski et al. 2018, pp. 422–423), with finds related to typographical work and telecommunication 1900–2005 (© Harold Strak)

Two showcases at Station Rokin

Archaeology was part of the art programme of the North/South metro line project. Each station features artwork with a specific theme by different national and international artists. The theme of Station Rokin in the heart of the historic city was history and archaeology. The commission for the platform walls of this station was awarded to the British/French partnership Daniel Dewar & Grégory Gicquel. Using different kinds of stone, they constructed a monumental mosaic of 33 enlarged images of every day modern objects inspired by archaeological finds in two 110 m long strips, together representing a sentence telling a layered story. Their sentence was called *The crocodile, the melodica, the pike fish, the high heel pump, the sportswear shoe, the rear derailleur, the tie, the sandal, the ballpoint pen, the pipe, the shrimp, the garden tiger moth, the pair of dice, the leopard frog, the sewing machine, the Welsh Corgi Pembroke dog, the calico cat, the flat-twin car engine, the rattlesnake, the French horn, the teapot, the wetsuit, the handheld fan, the mallard, the diving flipper, the paintbrush, the nutcracker, the whelk shell, the fishing lure, the foxglove, the umbrella, the dragonfly, and the badminton racket*. In addition to the artwork on the platform, two permanent displays of authentic archaeological finds were incorporated in the architectural design of the metro station by Benthem Crouwel Architects. The archaeological team in cooperation with the artists were responsible for the content and production of these showcases which were situated between the escalators at the south and north entrances to the platforms. The basic principle of the public display was to show as much archaeological finds as possible to reflect the abundance of the material deposits in the river Amstel, while treating each object as autonomous with its own unique meaning, ordered in the non-hierarchical urban functional classification scheme. The two massive glass display cases - 12 m long and 3.34 m wide at the north entrance and 14 m long and 3.59 m wide at the south entrance, both tapering down to a width of 2.06 m—contain in total 9,500 archaeological finds selected from durable mainly inorganic materials (ceramics, glass, metal or bone) (Fig. 7). The objects are attached with thin brass pins to the sloping bottom of the showcases, which follow the incline of the escalator (a gradient of 30°), giving the impression of a free fall of material remains. As each display is categorized, a hidden visual order is created in the apparent chaos of objects which lack any written explanation. The north display shows the categories (from top to bottom) *food processing and consumption, science and technology, arms and armour, communication and exchange, games and recreation, personal artefacts and clothing* and the south display the themes *buildings and structures, interiors and accessories, distribution and transport, craft and industry*.

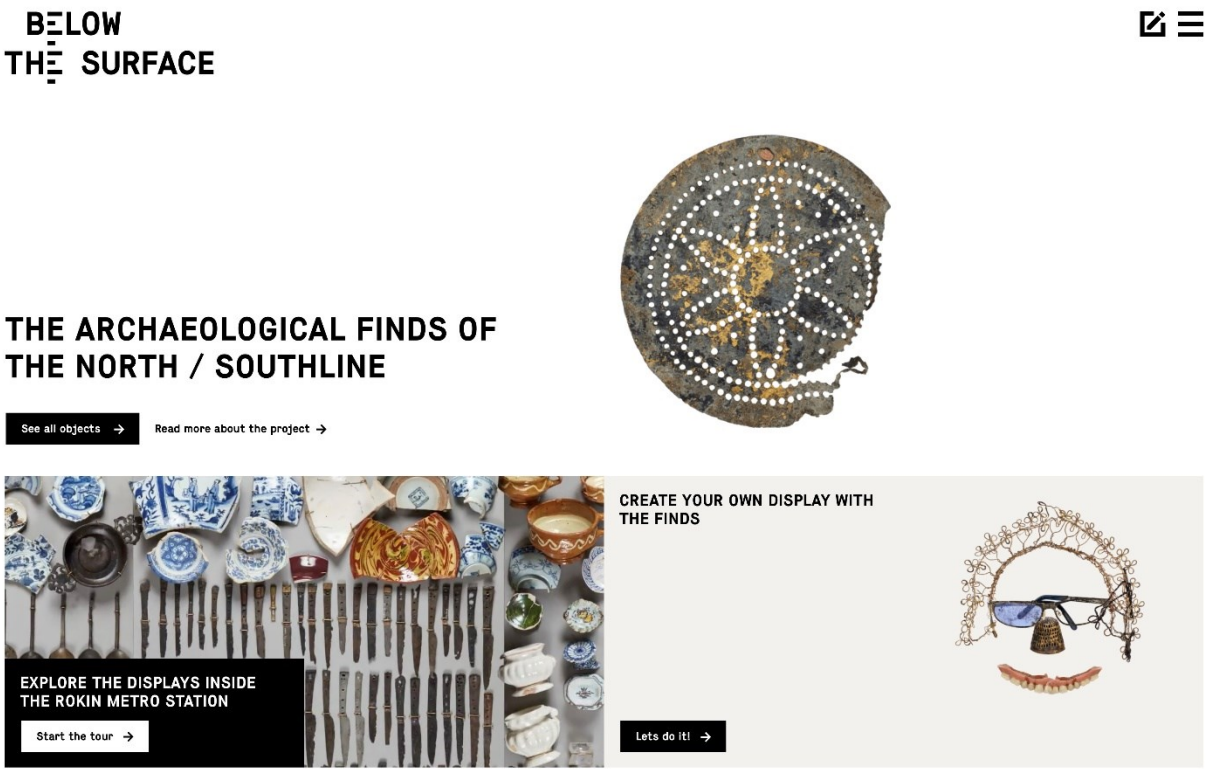


Fig. 7. The showcase between the escalators at the north entrance (photo: City of Amsterdam, Monuments and Archaeology; Ranjith Jayasena)

Belowthesurface.amsterdam web portal

To accompany the two displays a multipurpose archaeological website[1] was developed by the Department of Archaeology and the CTO innovation team (Chief Technology Office) of the city of Amsterdam. Although the station is an accessible public museum, which can be visited for the price of a mere metro ticket, the displays lack background information on the finds. Unlike in a regular museum setting, visitors and travellers are unprepared for the archaeological experience and the objects flash past as the escalators do not stop. Belowthesurface provides digital access to both displays, which are rendered in the website as a GIS model which is linked to the database. In this way details of each of the 9,500 finds on display can be directly accessed, either in the station itself by smart phone or at home behind a computer (Fig. 8). The core of the website is a timeline database, invented and designed by Fabrique and programmed by Q42, which enables the visitor to scroll through the finds from 2005 to more then 100,000 years ago. Alongside the timeline finds can be searched by material, function or location. The website contains more than 27,000 photographs of 19,000 finds. To zoom in on the different finds on line, Q42 applied Micrio, a IIIF (**International Image Interoperability Framework) compatible** platform (**image viewer and image server)** for telling visual, interactive stories with the highest resolution images. The site can be used for fun, and to do serious archaeological research as the complete dataset (135,000 records) of all (700,000) finds of the archaeological project is incorporated in B*elowthesurface.* The finds are not only

[1] https://belowthesurface.amsterdam

accessible in a passive way, but you can also create your own digital showcase of your favourite finds. Each find in the timeline database can be selected and added to a personal showcase which can be published online, on site. On Belowthesurface, archaeological finds can be used both as scientific datasets on our past and as visual elements in a creative display adventure. Different people from all over the world created their own showcases (3,050 by January 2020 since the launch of the website mid 2018) discovering a creative entry to science. As each element of the visual showcase composition stays linked to the archaeological database, Belowthesurface combines scientific curiosity with creative self-motivation, thus creating new ways to experience archaeology and the material past.

Fig. 8. Homepage of the website Belowthesurface.amsterdam containing three different functions: timeline database of 19,000 finds, the two showcases at Station Rokin and creating your own showcase (source: https://belowthesurface.amsterdam)

Postscript

For each product a specific design format was developed and invented to create an inviting and understandable language to tell archaeological stories. In the end, archaeology is all about story telling about the past. More then written historical sources, the archaeological objects have a strong visual impact. To visualise the Amstel river artefact story, new and exciting design options have been explored beyond the classical archaeological cataloguing systems to render meaning to material culture. In this construction process the archaeologist had to work together with non scientific partners, like artists, photographers and designers. Combined with new and innovative (digital) technology, trust proofed to be the most vital and basic prerequisite for finding attractive ways to

communicate with the public. By trusting the creative input of non archaeological partners, the archaeologist can avoid the straitjacket of traditional cataloguing and find new visual ordering for archaeological finds without nullifying or neglecting scientific standards.

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