Deposit Analysis. Fingerprints of Former Town Activities

The case of Vetterlidsalmenning, Vågsbunnen, Bergen, Norway

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1. Archaeological fingerprints

Since stratigraphy deals with formation, composition, sequence and correlation of *layers*, archaeology is in itself stratigraphy. For the archaeologist, *The strata* in question are the cultural deposits; archaeological material per definition. The *cultural deposits* found at archaeological sites are influenced by man in one way or another but remain strata proper. Cultural stratigraphy emerges from stratigraphical analysis. To understand a fluvial deposit one must know aspects of the behaviour of the transporting agent, the river and its history. For obvious reasons, understanding the culturally influenced deposits is not easy as understanding human behaviour is a difficult task. Recorded spatial distribution of cultural remains including all objects, not only those shaped by human hand, provides the base for dating and for identifying activities and site functions. The deposits are the archive. No object is there without a reason; the sum of them tells about their origin, i.e. cultural activity. The deposits are the fingerprints of former human activities; just as fingerprints disclose the criminal, the layers disclose their origin.

Unfortunately, to many archaeologists cultural deposits are only the matrix of their archaeological material, i.e. the kind of material which archaeologists are looking for and are trained to study. Archaeologists generally restrict themselves to remains and objects formed or shaped by human hand (building remains, crafts, tools, pottery etc.). At best, other types of material are handed over to relevant »specialists« according to the established ideas of »interdisciplinarity«. Such specialists (zoologists, soil scientists etc.) are, however, specialists in branches of natural science and usually have little training and background through which they can understand the »cultural deposits« better than can the archaeologists. Often, therefore, they restrict themselves to the items with which they are familiar: pollen, seeds, bones etc. The cultural deposits themselves remain in a vacuum. The result of such an approach is amputated or fragmented knowledge.

The understanding of the deposits themselves is essential for interpretation of all types or groups of material and finds. The artifacts and also other types of material – botanical, zoological, geological – are retrieved as parts of the total information that can be found in a deposit. Interpretation depends on the context within the layers. To take this case to an extreme, merely by being part of a deposit means that »archaeological« material (finds) has no more value than any other common objects such as twigs, charcoal, bark, sand, gravel etc. Cultural deposits require a proper interdisciplinary approach. All of the disciplines involved must have the same objective and focus, namely, to uncover the cultural history of the site, i.e., *the human activity which formed the cultural layers.*

2. *Classification*

Approaching the cultural layers

Approaching the deposits most information about its composition is hardly recorded at all due to the lack of a proper classification system.

There is a general need for a standardized method for the classification of cultural deposits, and methods of conservation should be developed. Modern analogues, i.e., information on how deposits are formed, are important. The formation and preservation processes are at present insufficiently understood.

Urban sites generally have good preservation because of the rapid accumulation of cultural debris. Their deposits are often waterlogged and their contextual information clear. Their potential has not been fully utilized until now. On the other hand, prehistoric rural dry-land sites often exhibit amorphous homogeneous cultural layers. As organic deposits decompose the »fingerprint« fades out, so that interpretation becomes difficult.

Any experienced field archaeologist is aware of the differences in soil and soil properties within and between sites. Relative differences between deposits, layers and strata are frequently used for classification in the field. Such soil classification is seldom used for more than a local and personal recognition of certain site features and only occasionally are soil data recorded in a way which makes post-excavation analysis possible.

Considering cultural deposits as remnants of former activities is in accordance with the principles of most fields of stratigraphy. The main principles of deposition and decomposition are the same, regardless of whether the soil is anthropogenic or »natural«.

Indentification of the parent material (matrix) is a major step in reconstructing the environment. Different human activities produce material (waste) of varying structure and composition. The environmental setting is also important as the constituents are modified accordingly. The composition of the parent material gives key parameters: different environments and different human activities produce different materials which also change with time. A better understanding of the site and past activities will be obtained if the total soil composition is considered.

Genetic classification (Classification by origin)

At the end of the 19th and the beginning of the 20th century there were various schools working on the post-glacial stratigraphy of Scandinavia. They refined descriptive stratigraphy into an effective and independent tool for the study of the history of climate.[1] Fægri and Gams[2] constructed soil-classification systems based on field methods. In principle, these methods were qualitative and the classification genetic; the main objective was to identify macro plant remains and, thereby, the soil producing original »mother« vegetation.

The humidity conditions at the time when the soil was formed were important; thus, humification and structural features were important. Emphasis was placed on deducing stages and changes in the hydrosphere of deposits. The number of defined types of deposits was restricted in Fægri and Gams's system of classification, and applications outside the field of research for which they were created were limited.

Descriptive classification
(Classification by visible features)
»Quantitative« descriptions of composition, structure and state of preseration represent potential ways of understanding genesis. It was therefore a major step forward when Troels-Smith [3] published a descriptive and analytical system for organic soils; he emphasized that no deposits were pure, they were all mixtures of various proportions. Troels-Smith worked on archaeological sites preserved in wetland deposits. He used the analysis of deposits to deduce the environment.

Troels-Smith defined a number of constituent elements (mainly »natural« elements) and the ways through which their presence could be presented quantitatively. He also defined a group of subsidiary elements, among which archaeological remains were included.

His system is still the most comprehensive and useful although some scholars (not only archaeologists) consider it to be too complicated for general use: it has a high learning threshold.[4] It can also be argued whether Troel-Smith's divisions into constituent and subsidiary elements are generally applicable or whether they should be redefined for cultural deposits. Good arguments can also be raised against his complicated and inappropriate »Latin« nomenclature. Nevertheless, the present author knows of no other general system which can replace Troel-Smith's classification. Pedological systems devised subsequently are too general and are inapplicable to cultural deposits.

Classification of urban cultural deposits
Many genetic and descriptive types of classification are used in urban archaeology today. Terms inherited from other excavations and contexts are mainly used without thought, and different types of terminology are frequently confused. The proper use of terms seems never to be considered.

Descriptive terms such as »humus layer«, »sand layer« and similar concepts are often used. These describe a feature which, to the archaeologist, differs from its neighbour. The layers are labelled accordingly. Pseudo-descriptive terms arrived at in this way are not particularly useful for classification or interpretation, and they therefore do little harm. If, however, genetic terms (named by »origin«) are created or adopted without proper consideration they may cause confusion.

3. Medieval urban deposits

The pioneer archaeological excavations in the Medieval town of Bergen, starting in the mid-1950s, revealed thick organic deposits in and between building structures and in front of harbour constructions. Their origin has been the subject of some discussion.[5] Even though stratification indicates deposition over time most of the excavated layers were considered as »fill«, being intentionally deposited to acquire land for urban development. Other layers were regarded as »levelling layers«, dumped to compensate for the sinking ground. These conclusions were based not on analysis of the structure or composition of the deposits but on the location of the layers and their position relative to the constructions which were present. The terms were later adopted for certain types of deposits identified by their content of organic debris. Whether or not the terms were appropriate for the early Bryggen excavations is not a question to be dealt with in this paper.

The Bryggen excavations created a school of urban archaeologists through whom the general methodology and concepts were inherited and exported to other towns. Similar deposits were found in other medieval waterfront towns. Unfortunately, »fill«, »fill mass« etc. became expressions synonymous with many types of waste deposits and today is the term most frequently used for deposits in towns. It is essential to understand what is actually meant by the concept »fill«, and what the layers really represent.

So, »fill«, as also »fire layer« are genetic terms. Genetic terminology such as that mentioned above is dangerous since it jumps to conclusions without proper documentation.

The genetic concept of »fill« is particularly dangerous as it implies that the soil is secondary although there may be no evidence of secondary deposition. The term suggests that the deposit was first sited elsewhere, whence it was moved and used as fill for a specific constructional purpose.

The concept of »fill« has important consequences for understanding urban development. It implies that the land was intentionally extended for development. Secondly, being secondarily deposited, information from the artifacts it contains is of less value than those from layers considered to have accumulated *in situ*. Consequently, the fill is often removed with a minimum of recording during excanation.

Natural and anthropogenic redeposited organic materials often have their own characteristic fingerprints. It is virtually impossible to move soil from one place to another without changing features such as object orientation and lamination. Furthermore, redeposition changes the depositional environment. Anaerobic material is very often exposed to oxygen; leading to humification and decomposition.

Consequently, the »fill« concept should be reconsidered, or used only when there is clear evidence of redeposition for constructional purposes. The majority of deposits consist of debris from urban activities *accumulated in situ* over time.

Accumullated layers are primary deposits and as such they reflect specific urban activities. Town development and local aspects should be reconsidered accordingly. If the layers are primary their artifacts have been deposited *in situ* and town development must be the consequence of, not the reason for, deposition.

4. Activities and their subsequent debris

The classification of deposition is useful only when it can lead to a better understanding of deposit-forming activities. Some processes are self-explanatory. Food processing produces refuse diagnostic of the food consumed and cooking practices. Slaughtering sites, stables and latrines all have characteristic refuse which can be identified, although not always easily.

In most cases, focus on the particles or elements of a cultural layer can increase our knowledge. Remarkably little interest has so far been paid to the wood chips which are often a main element in waterlogged urban deposits. Recording different types of wood chippings, which represent different forms of woodworking, can show the activities on a site. They are the »fingerprints« of the craftsmanship which took place there.

If logs are chopped with axes at right-angles to the grain short angular wood chippings are produced; these are significantly different from the wood chippings resultant from trimming planks along the grain. Each operation demands a different type of axe, and each produces a different type of chipping. The configuration of the edge of each wood chip is literally printed upon it. If a knife has been used, then there are characteristic splinters; if a plane, then shavings result. Timberwork and carpentry produce chippings on the workplace. Most of the chippings will lie horizontally, forming homogeneous and laminar deposits. Secondary deposition will disturb lamination and speed up humification. Similar depositional characteristics may be expected from other crafts and industries. Tanning uses large amounts of ground tan-bark, the type and structure of which tell us about the method of manufacture. Bark is, however, used to impregnate sail. Methods of production and the resultant waste differ.

5. The need for a systematic and quantitative approach

The connection between activity and the type and composition of the deposit has been used to interpret botanical remains and site features as a better understanding of site activities and the mikro and macro remains comes from a better understanding of deposits.[6]

The qualitative differences between sites may be small in general. The composition and structure of cultural deposits may appear, at least superficially, to be remarkably similar from site to site, and from one Scandinavian urban excavation to another. Wood chippings, nuts, straw and bones are all present at each site. Decomposition varies, however, as in the case of the »Black Earths«. These deposits are coloured by the non-decomposable ash and charcoal dust which increase and dominate with the decomposition of combustible matter. Differences are visible within each site and quantitative if not qualitiative differences between and within sites should, therefore, be expected.

The close cultural linkage between »non-archaeological objects« and cultural history is an important aspect of a site. If botanical, geological and zoological analyses of urban refuse layers are to have any meaning, the origin of the layers themselves must be understood. This approach has led the way to detailed site information. There is now a need for a systematic and quantitative approach. Systematic analysis of the deposit and the quantification of differences in composition and structure form the core of deposit analysis. Deposit analysis introduces no new methods but simply uses well known techniques to obtain the information available and to integrate this in the overall interpretation.

6. A pilot projekt

A pilot project has started in Bergen; this integrates the site parameters and field interpretation of features with field observations of structure and composi-

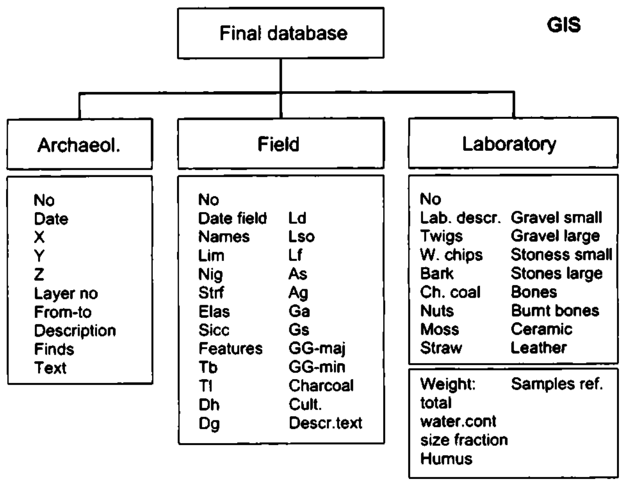

Fig. 1. Database structure.

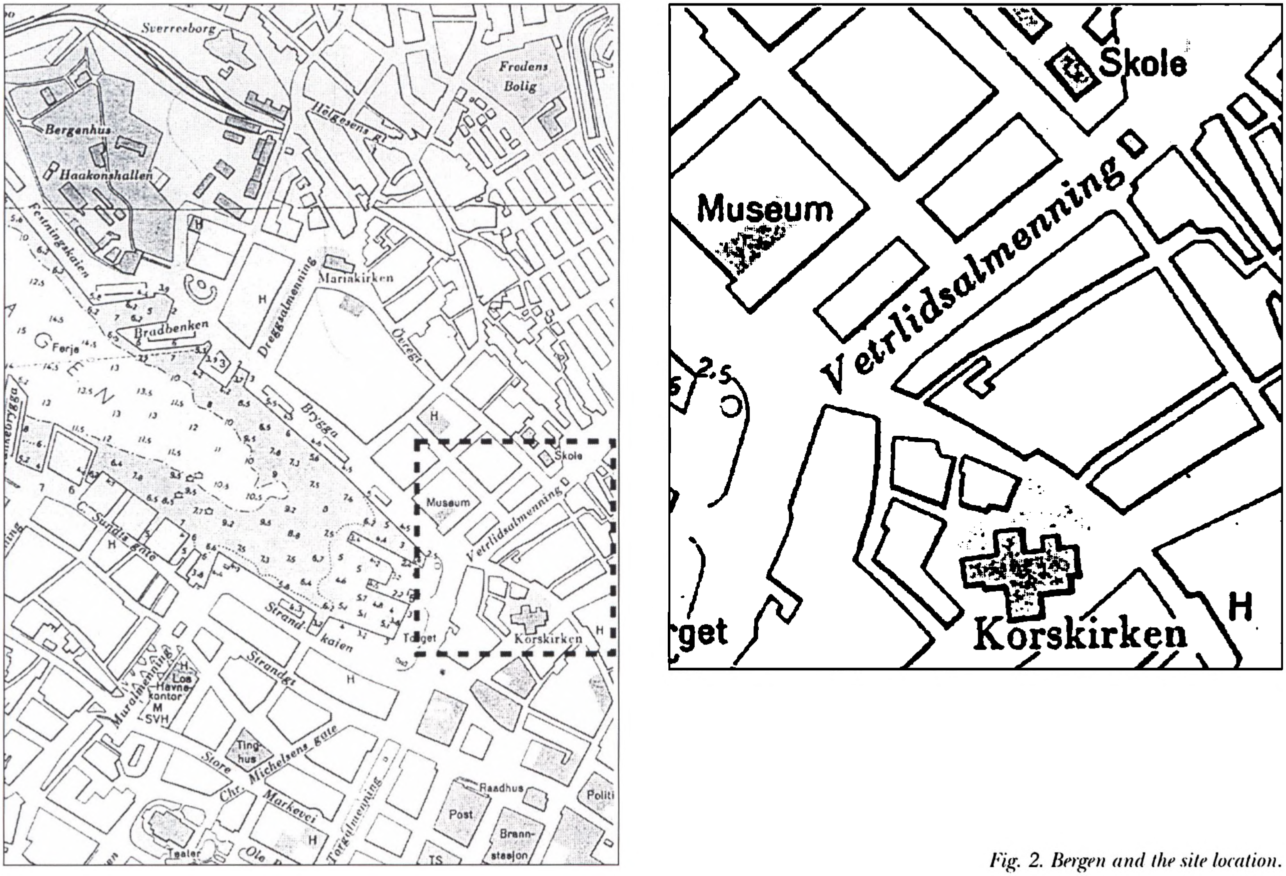

Fig. 2. Bergen and the site location.

tion. This is controlled against laboratory data on a number of soil parameters. The purpose of the project is to create a local deposit database. The conserved bulk finds and material not identified in the first phase but stored for later analysis are included in order to ensure that interpretation may be updated during post-excavation work when data from special analyses may become available. The database is designed to be extended and refined over time. New material will be added as new sites are excavated in future years (fig. 1).

The project began in 1991 when sewers, pipes and cables were laid in Vågsbunnen, Bergen. This site lies south of the main excavation area of Bryggen (fig. 2). Lack of time and money, and limitations set by the local municipal authorities, meant that the

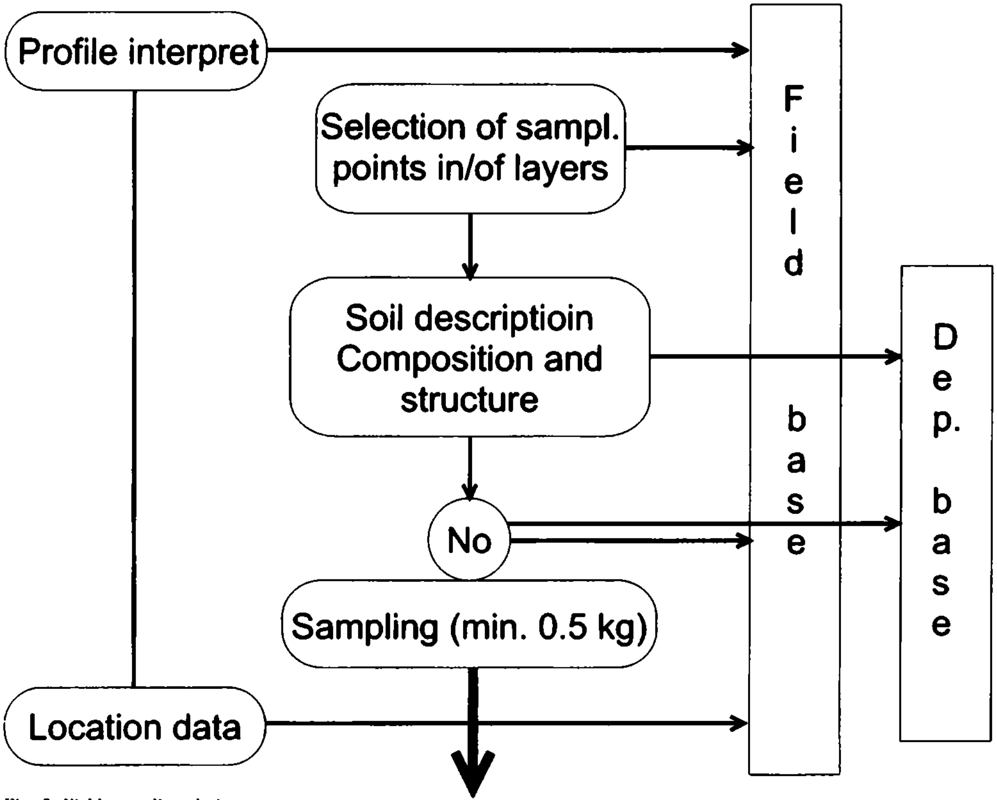

Fig. 3. Field sampling design.

trenches were not excavated in detail but the sections were recorded by archaeologists. The identfiable cultural layers were described and routinely sampled.

The field-sampling design is as illustrated in figure 3. The sampling strategy was selected for each section, based on their field interpretation. Location, layer number, general archaeological description and interpretation formed the basis for the field database. The description of deposit structure and composition in the field based on Troels Smith 1955[7] were recorded in a deposit field-database with the layer number as identifier.

The samples were treated in the laboratory, as shown in figure 4. The two main objectives of the laboratory treatment were to identify the major constituents of the material and to conserve them for later analysis. Reference material was selected so that these objectives could be achieved.

One sample (minimum 0.5 kg) was freeze-dried for reference and later use, and a similar quantity

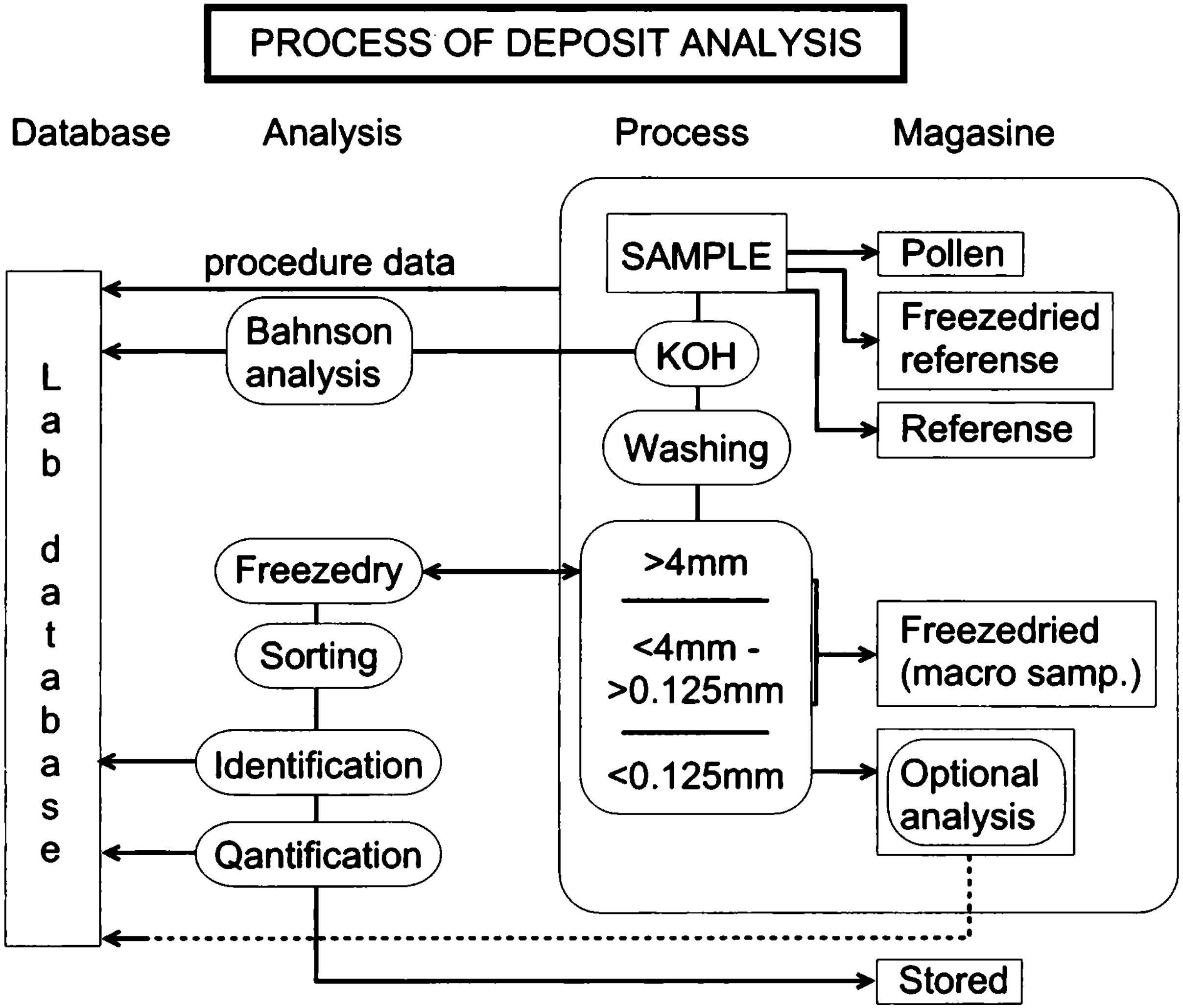

Fig. 4. Laboratory sampling procedures

washed and sieved. Objects larger than 4mm were freeze-dried and sorted. Humification is an important measure of the depositional environment and subsequent decomposition, thus, the concentration of humic acid was the selected parameter, with 1ml of the first KOH extraction being used for Banson

(1968) humification analysis. The remainder (<4mm) was saved for later macrofossil analysis. A sample taken from a homogeneous »raw sample« (untreated material) was retained for pollen analysis.

The sorted content of macro-material larger than 4mm was quantified (scale 1-10). Data were stored in the laboratory database, identified by sample number. The database will be refined as projects continue, and new databases will be compiled when new and important constituents can be added. »Specialist analyses« will form different data sets for cross-pairing with depositional parameters.

This database formed the basis for an archaeological GIS (Geographical Information System: ARCGIS), including topographical and archaeological information. Data can be retrieved from ARCGIS to make a two- or three-dimensional graphic presentation, thematic mapping and spatial data correlation. Numerical methods are now testing the correlation between data sets.

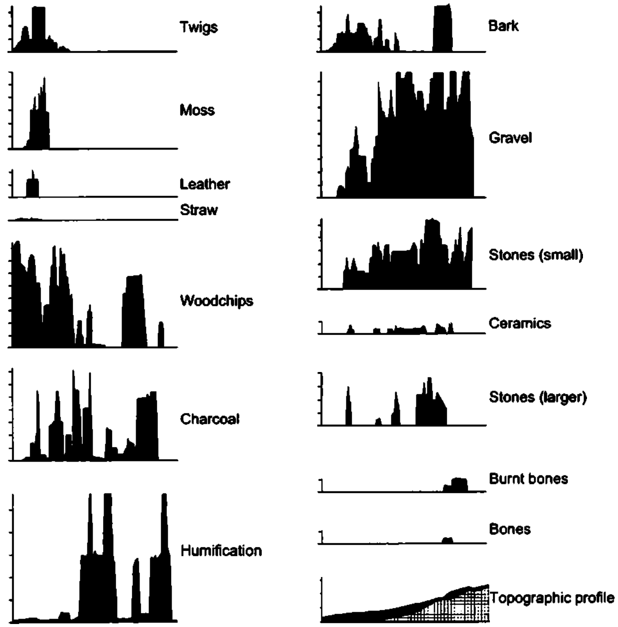

Fig. 5. Distribution along trench profile. Left is lover west and right upper eastern part of the profile.

7. Results

The spatial distribution of some main depositional elements from Vetterlidsalmenning is presented in figure 5. All the data are taken from the laboratory database, linked to X and Y co-ordinates. There is no separation into contemporaneous horizons or depth. The curves indicate the variation in relative frequency of components with their position in the Vetterlidsalmenning trench. The section of the trench and the thickness of the cultural deposits are shown on the lower right of figure 5. The left of figure 5 shows the area near the harbour, and the extreme right shows the sandy terrace at the foot of the Fløyen hill.

The first attempt to integrate three-dimensional information (in reality, 2.5 dim: x,y plus value of data). It indicates a clear relationship of depositional parameters to location. Samples taken from within the same area of the trench were related in composition and structure, but they were otherwise different.

In the lower area, which was near the former shoreline, organic material with a low rate of decomposition dominated. Its main components were moss, twigs and wood chippings. Fragments of leather were also common in a small part of the trench; they may reflect the presence of a bark structure further upstream which may have been associated with tanning for impregration of sails.

Well drained soils and redeposition were partly responsible for the high humification in the middle and upper parts of the trench where minerogenic components and organic materials resistant to decay were dominant. Concentrations of charcoal were high in the lower and middle area where there was evidence of smithing and slag. Concentration of charcoal was present at the top of the trench; this resulted from the oxidation of agricultural soil. The radiocarbon dates indicate that the activities in this area were earlier than those in the urban area below.

The impressions from this preliminary analysis may be summarized below:

1. Structure and composition differ at the site and this can be detected and classified by the methods outlined above
2. Types of deposition are related to site activities and topography
3. The results are encouraging as they will enable systematic mapping.

8. *Acknowledgements*

The Vetterlidsalmenning excavation was administered by Ann Christensen in co-operation with Dr. Siri Myrvoll and headed by Rory Dunlop. Helga Norland, has been responsible for data registration and field/laboratory assistance. Botanical Institute, University of Bergen, kindly provided laboratory facilities. The project was financed by Riksantikvarens Utgravningskontor, Bergen.

Notes

1. von Post and Granlund 1926.
2. Fægri & Gams 1937.
3. Troels-Smith 1955.
4. Christensen 1989.
5. Helle 1982. P. 130, 189, 208.
6. Krzywinski et al. 1983.
7. Based on Troels-Smith 1955.

References

Bahnson, H. (1968). »Kolorimetriske bestemmelser af humificeringstal i højmosetørv fra Fuglsø mose på Djureland.« *Meddelser Danmarks Geologiske Forening.* 18: 55-63.

Christensen, C. (1984). Karakterisering at Jordarter 13. Jordartsprøver N9. In: *Arkæologisk felthåndbog.* J. Hertz, M. S. Jørgensen, H. J. Madsen, M. Ørsnes. (Eds.) København.

Fægri K, H. G. (1937). »Entwicklung und Vereinheitlichung der Signaturen fur Sediment und Torfarten.« *Geologiska foreningens Stockholms forhandlinger.* 59: 273-384.

Helle, K. (1982). *Bergen bys historie. Bind 1.* Bergen.

Krzywinski, K. S. Fjelldal & E. C. Soltvedt (1983). *Recent Paleoetnobotanical work at the Mediaeval excavations at Bryggen, Bergen, Norway.* P 145-169 in Proudfoot, B. (ed): *Site, environment and economy.* BAR international series 173.

Troels-Smith, J. (1955). »Karakterisering av løse jordarter.« *Danmarks Geologiske Undersøgelse* 4, 3(10): 1-73.

von Post, L. & E. Granlund. (1926). »Södra Sveriges torvtillgangar.« *Sveriges Geologiske undersøkelser Ser. C* 335(4): 127.