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Svendborg in the Middle Ages

– an Interdisciplinary Investigation

by HENRIK M. JANSEN
with contributions by TOVE HATTING and INGRID SØRENSEN

Since 1972 a team of about 30 specialists, archaeologists, historians, medical researchers and natural scientists, have taken part in the archaeological investigations of Medieval Svendborg and of Ørkild, the royal stronghold to the northeast of the town. A wide range of scientific techniques have been used to augment the information about contemporary life which the scattered written sources and traditional archaeological methods can provide. Some examples of these will be discussed in the following paper. The purely archaeological evidence will only be outlined in brief and further information can be had from the sources listed in the bibliography.

THE EARLIEST SVENDBORG AND THE TOWN IN THE MIDDLE AGES

Written sources tell us nothing about how and when the town came to be founded. Evidence from archaeological and pollen analytical investigations suggests that it took place in the second half of the 11th century. Ingrid Sørensen's pollen analyses (see later) show that it was at this time that a valley to the north of the town called *Dronningmaen* was dammed, doubtlessly in connection with the creation of a mill pond and the establishment of an associated water-mill. Furthermore the particular form of the graves excavated in the graveyard to the south of the Franciscan Monastery suggest that the graveyard had been used for some time before the Franciscans took over in 1236. There are hazel rods in the graves, a feature which in Lund, Sweden, amongst other places, can be dated at the latest to the first decade of the 12th century. Usually this heathen practice is seen in graves of the 11th century. The phenomenon is known from Viking burial rites, being the symbol of the tree of life, and it was allowed to continue into the earliest Christian period.

It was purely by chance that Svendborg entered the written sources as late as 1229. By this time Svendborg was already a thriving town which had been granted royal charters and which possibly had two brick-built churches, St Nicholas's church and the church down at the shore which the Franciscan monks took over in 1236. Svendborg's entrance into the pages of history took place in very romantic circumstances. In a letter of 23 June 1229, to Valdemar the Young's wife, Princess Eleonora, daughter of Queen Berengarias brother, King Alfonso II of Portugal, concerning her morning gift, Valdemar II confirms the handing over to her of the southern part of Funen with the three 'castra' (translated as 'castles'): Swineburgh, Wordburgh and Foburgh, plus half of the income from the mint on Funen as well as that from the whole of the town of Odense. When Eleonora died in childbirth less than 2 years later, everything in the gift reverted to the king.

The interpretation of the name 'Swineburgh' has occupied historians and place-name researchers for centuries, but there is now agreement that it is not the man's name Svend to which the first part refers but to *svin* (= pig). Whether this is *vildsvin* (wild boar), *oldensvin* (domesticated pigs fed on mast) or *marsvin* (porpoise) is still not clear. In the 12th century there were several royal castles with animal names for example Flynderborg (*flynder* = flounder) and Kalundborg (*kalund* = jackdaw).

There have been attempts to locate Swineburgh at various sites in and around Svendborg. It is most probable, however, that it lay near where the later Skattertårn, which has much in common with other fortified towers from the 12th century, came to be built.

The large royal castle of Ørkild, which lies to the northeast of the town in the parish of Tved, was the subject of small trial excavations in 1979 and 1980 in connection with an extensive tidying-up operation on the site which had fallen into disrepair. The collection of

THE SVENDBORG PROJECT 1972 – DIRECTOR: Henrik M. Jansen

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Parasitology
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Anthropology
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Geology
Kaj Strand Petersen

Metallurgy
Sidsel Fregerslev
P. Solgaard

Archaeological chemistry
Hans Toftlund Nielsen
B. Funder Schmidt

Radiocarbon dating
Søren Håkanson
Henrik Tauber

Carbon-13 analyses
Henrik Tauber

Table 1. Project organization.

finds from Ørkild showed that life there was very different in many ways from the picture we have of daily life in the medieval town, something clearly illustrated by Tove Hattings's analyses of the zoological material, for example.

It is obvious from the oldest surviving charter granted by King Christopher I (1252–59) on the 25th February 1253, that Svendborg had the status of a provincial town under Valdemar II (1202–41). In this document it is stated among other things that 'all the laws and priveleges that they (the inhabitants of Svendborg) had in our father's time – in blessed remembrance – are confirmed'. With regard to further details of the topographical development of the town reference is made to the bibliography; only a short account of the monastery investigations carried out between 1975 and 1980 will be entered into here.

Svendborg's Franciscan Monastery was established on the initiative of Valdemar II's castle baliff (castellanus), the grand-seneschal Astrad Fracki in 1236. This was 4 years after the first Scandinavian monastery of the order had been founded in Ribe and only 10 years after the death of St Francis in Assisi. The fact that Svendborg was among one of the first places in Scandinavia that made provision for the Franciscans supports the idea that as early as the beginning of the 13th century, Svendborg was a community of sufficient economic might to make it attractive to the holy fathers, who despite their vows of poverty were conscious of the alms they would recieve from the community amongst whom

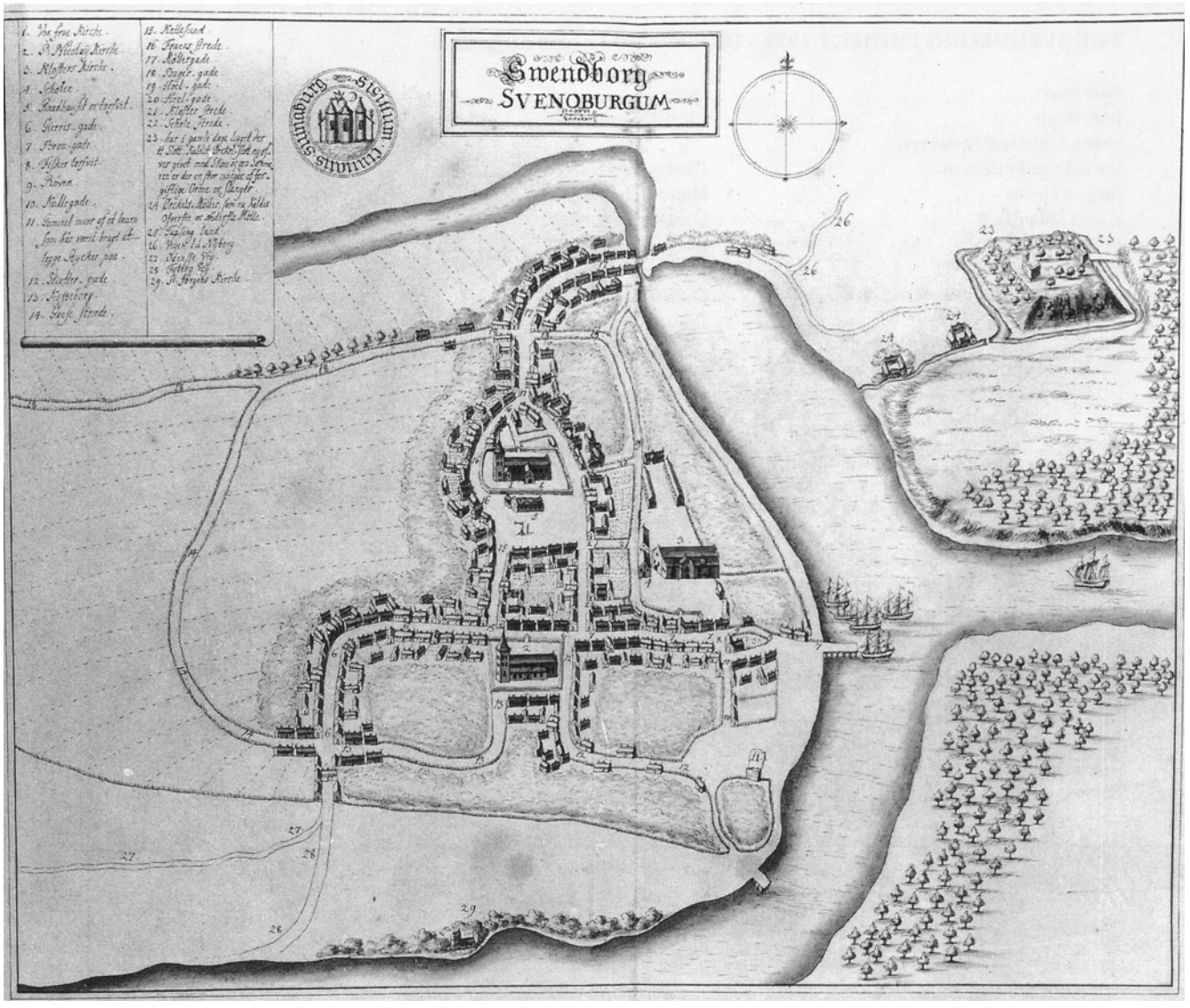

Fig. 1. Svendborg. Illustration from P.H. Resen: *Atlas Danicus*, 1667.

they were assigned to work. Svendborg doubtlessly enjoyed the prosperity that came with Baltic trade when the Valdemars became established in the second half of the 12th century. Even after the north German towns took over this trade during the course of the 13th century, Svendborg continued to flourish unabated. At the end of the medieval period, the town defences enclosed a built-up area of about 18 ha, and in addition there was the small suburb of Kongens Mølle (the Kings Mill) which lay outside the defences to the north.

Information about the monastery complex itself is sparse. Astrad Fracki arranged for the handing over to the monks of a large area of ground in the north-east part of the town, down at the shore, which possibly extended all the way up to the town defences. As outlined above the excavations in the monastery church and in the cemetery revealed that there was already a church and churchyard on the site in 1236 when the monastery was founded (fig. 3).

The establishment of the leper hospital, later St George's, west of Svendborg, similarly took place in connection with the activities of the Franciscans in the town. The present St George's church is the only one remaining of 37 churches and chapels performing a simi-

1. Bagergade 42a	Land Reg. No.	91a	1985
2. Bagergade 20–22		102–103	1981
3. Møllergade 55		126a	1983
4. Møllergade 62		232	1984
5. Toldbodvej		231	1986
6. Krøyers Have		362	1973
7. Bagergade		62	1974
8. Fruestræde 8		296	1985
9. Vor Frue/Our Lady's church			1972
10. Market Square			1972
11. Gåsestræde 4		421	1985
12. Badstuestræde/Gerritsgade		466	1980
13. Korsgade 4		482	1972–73
14. Møllergade 1		449a	1972–73
15. Møllergade 6		607a	1976–77
16. Monastery V-VI			1979–80
17. Monastery II			1977
18. Monastery III-IV			1978
19. Monastery I		263	1975–76
20. The church of St. Nicholas			1972–73
21. Brogade		618a	1973
22. Skattergade		503	1981
23. Kullinggade		544a	1974

Fig. 2. Map of Svendborg, 1863, with sites excavated since 1972.

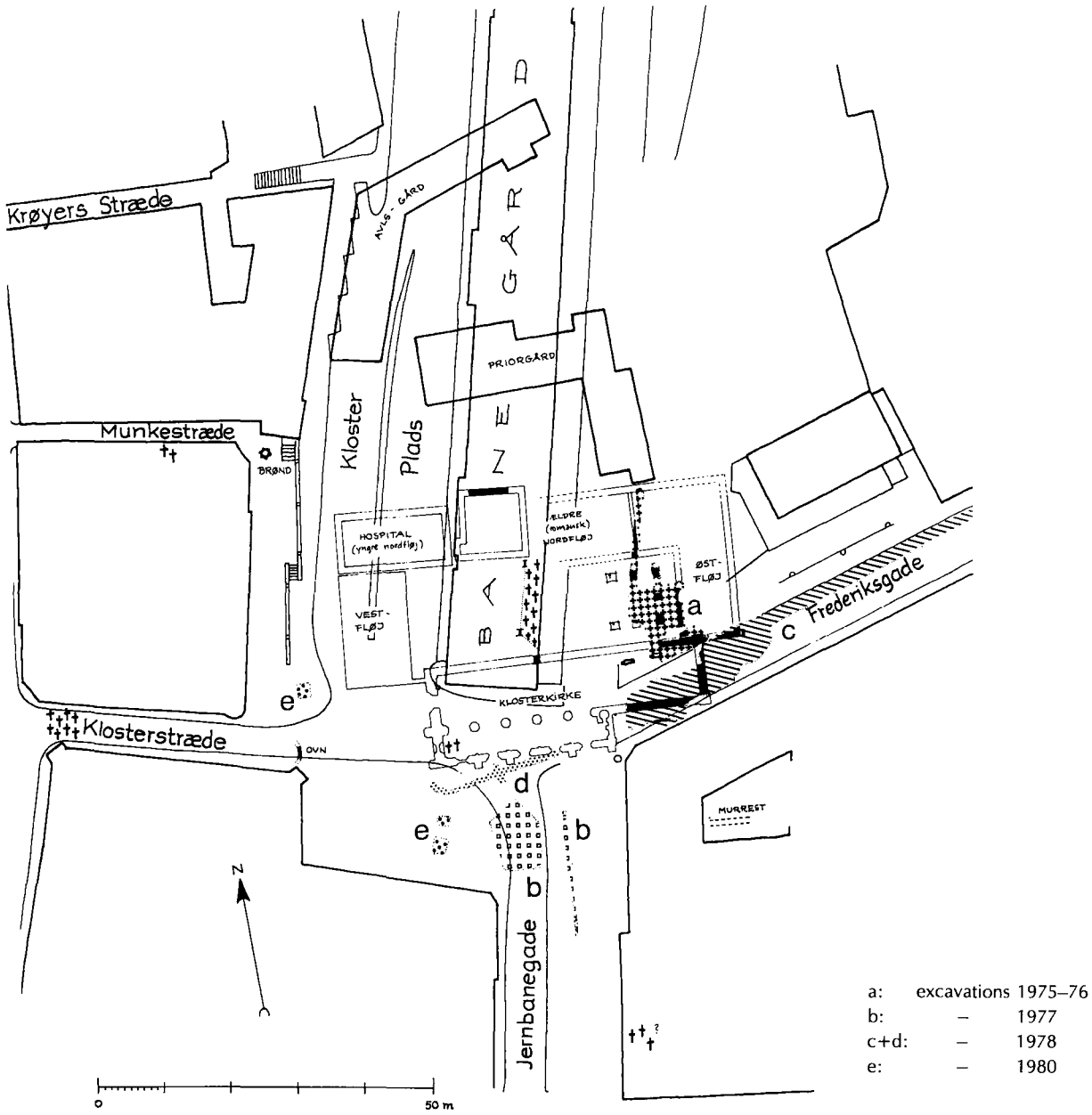

Fig. 3. Map of excavations in the central part of Svendborg showing a plan of the Franciscan Monastery based on excavations 1975–80 and previous evidence. Black indicates remains documented during recent investigations. Other parts of the complex of monastery buildings are reconstructed from Land Register maps.

lar function, which were abolished in 1541 'as leprosy is not as common in the land as she was in the past'.

In 1975, when it first became possible to undertake archaeological investigations on the site, there was not one visible sign above ground of the Franciscan monastery's existence. Everything had been razed to the ground in the sacred name of progress. Luckily the conditions for preservation of organic material were particularly good in this part of the town due to the extremely waterlogged nature of the Medieval refuse layers. Excavation was concentrated on the monastery chapel and those parts of the churchyard which were in use un-

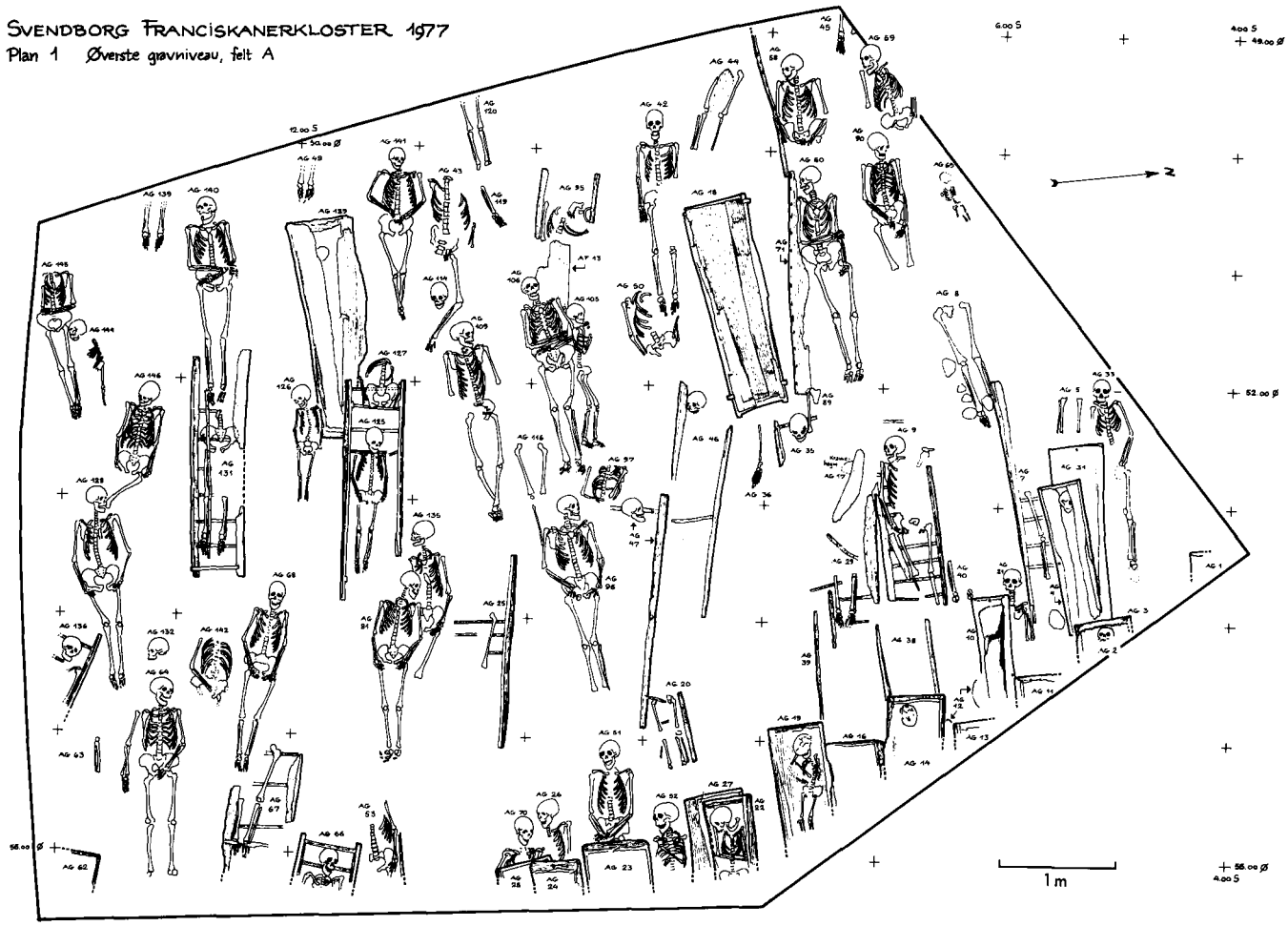

Fig. 4. The excavated part of the churchyard south of the Franciscan Monastery church, showing the uppermost level of graves. Jens Bech *del.*

til immediately after the beginning of the Reformation, *i.e.* c. 1550.

THE MEDIEVAL POPULATION OF SVENDBORG

The following is a short account of the results of the medical and anthropological analyses carried out by Izabella Tkocz, Niels Brøndum and their co-workers which are presented in full in volume 3 of *The Archaeology of Svendborg*. From the examination of about 200 individuals, partly from the monastery's cloister and partly from the churchyard (fig. 4), there is not thought to be any doubt that those buried in the churchyard can be taken as representative of Svendborg's population as a whole and therefore the following can be said of the average Medieval inhabitant.

As was the case over the whole of Europe at this time, the level of child mortality was high and children and adolescents made up 25% of the material collected. Nevertheless this is a lower total than that known from Viborg for example, which leads the researchers to suppose that the excavated skeletons represent a population with a lower than average mortality rate for the time. The average age at death was around 33 for men and 28 for women. Of course these figures reflect the high child mortality rate but also destroy the myth that it was men who went out and sacrificed themselves for women. It appears to have been much more dangerous to stay at home and give birth to children than to fight

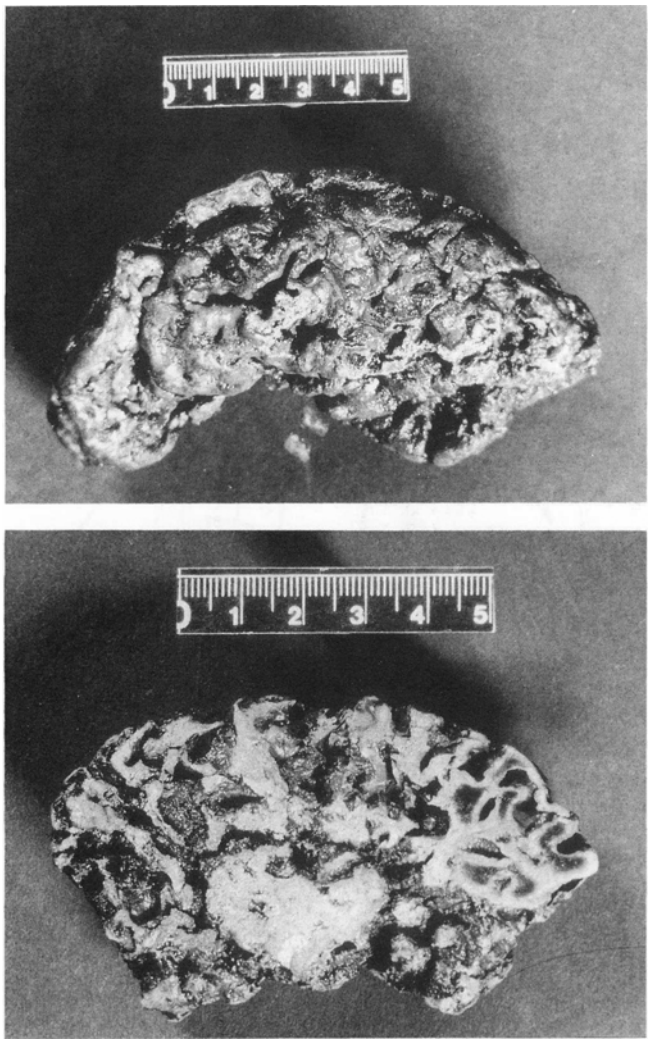

Fig. 5. Above, one of the best preserved Medieval brains from Svendborg. Length: 11.6 cm. – Below, section through the brain shown above. Photo by the Institute of Anatomy, University of Odense.

for God, king and country. Despite considerable knowledge of hygiene, many women died in labour. One should be aware however of one possible source of error in these calculations. An estimated 10% of the churchyard was excavated and it is known from other sites that it was the practice to bury children in a particular part of the churchyard, a phenomenon which was possibly also encountered during a small investigation of the western part of the churchyard in 1980.

The average height of the inhabitants was 175 cm for men and 163 for women. Naturally we were amazed by these figures. If they are compared with those for Denmark as a whole in the 17th and 18th centuries, the latter appear almost as 'midgets'. Even as late as 1850 when compulsory national service was first introduced, the average height of men in the first intake was found to be only 162 cm.

The Svendborg analyses show furthermore that the Medieval men were large and strong and had well-developed muscles. In contrast to today's population which has mesocephalic crania, those of both men and women in Svendborg were dolichocephalic and some of them, a total of 57 in all, contained remnants of brain (fig. 5). The fact that it was possible to make such fantastic finds is probably due to the very special biochemistry of the brain and Svendborg's anaerobic alkaline soils. That these shrivelled remains really were the remnants of brains was established by a combination of light and electron microscopy and biochemical analyses and although nothing remained of the meninx, the scanning electron micrographs clearly showed that brain structures were present. The largest brains measured up to 12 cm in length and 9 cm in breadth and were 5–6 cm in height. They weighed between 170 and 200 gr., whereas the small fragments weighed only 10–15 gr.

All the skeletons of people over the age of 25 showed evidence of osteoarthritis particularly on the spinal column. Osteoarthritis was probably more widespread than it is today almost certainly as a result of the hard physical labour and lack of labour-saving devices at that time. It is clear that poor housing and life in open boats would have predisposed people to these afflictions, which were treated both by medicine and magic. The medical treatments used included herb decoctions and salves as well as abdominal belts of animal skin. Magical items included precious stones, magic spells and pilgrimages to the graves of the saints.

In many cases it is difficult to establish the cause of death from the skeleton alone in that many diseases caused by bacteria and viruses leave no trace on the bones. The bone material therefore shows only a few pathological changes. Some of those which were apparent will be described here.

Firstly a very unconventional burial, No AG 18 (fig. 6), where the corpse died of an affliction which has never before been demonstrated so far back in time. It appears that it was a man in his fifties who was buried in a domestic lidded bench, made of soft-wood. The corpse's head rested on a fine pillow made of wool and flax and there were traces of a shroud and possibly of actual bandages. X-ray investigations showed that he

Fig. 6. Grave AG 18, a man buried in a wooden bench. The deceased suffered from cancer of the prostate. It is the earliest known case of this disease, the coffin being dated to 1472.

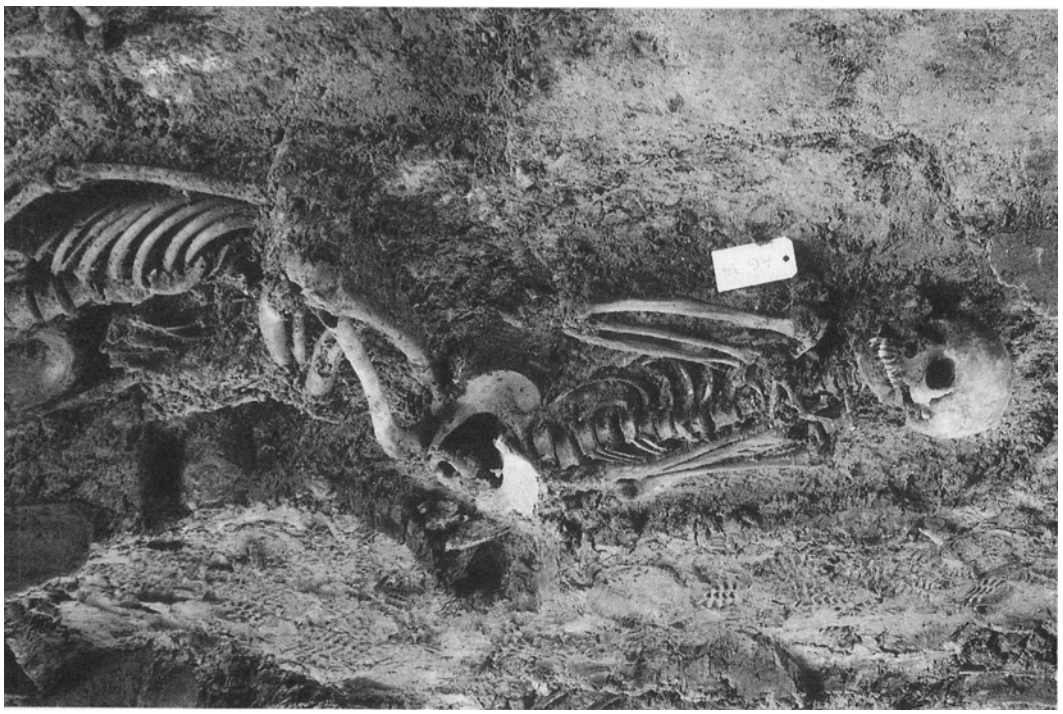

Fig. 7. Grave AG 34, a 17 year old girl who died of syphilis or yaws.

suffered from cancer of the prostate and metastasis in the ribs, the vertebral column and the hip. The coffin is dated to 1472 and as mentioned earlier this is the earliest recorded case of this disease in the western world.

Many women died in childbirth, and although this is not an easy thing to show from the skeletons, in at least 4 cases the researchers are sure that this was the case.

A further burial, without a coffin, involved a great deal of work for the researchers. The skeleton was of a 17 year old girl who was buried quite differently from the traditional Christian burial in that she lay on her side with her legs tucked up (fig. 7). There is a radiocarbon date of c. 1580 and the cause of death was either syphilis, the so-called non-venereal kind, which means that the girl was infected from her mother whilst in the womb, or yaws. Nonveneral syphilis, like yaws, is usually acquired in childhood under unhygienic conditions through body contact or use of common eating and drinking utentils. It was known even at this early time that syphilis could be treated with mercury, but this did not happen in this case however. It is my theory that the doubtlessly indescribably repulsive body of the poor girl was buried in the graveyard after the latter had gone out of general use. This would also explain the odd attitude of the corpse.

As can be seen from the above we have dates for some of the coffins, however we are still waiting for the final dendrochronological dating of a number of them.

The exceptionally well-preserved skeletons continue to attract the interest of new researchers. Professor Philippe Grandjean of the Institute of Hygiene at Odense University has begun a heavy metal analysis of the teeth from the Franciscan churchyard. The concentrations of several heavy metals, including cadmium, lead and mercury, will be compared with those in teeth in children in present day Århus. The results will show whether the present-day Danish population contains more or less of these elements than their Medieval predecessors.

Very few of the skeletons show signs of violence. On one man's skull a cut-like lesion was identified. The man lived for a short while after receiving the blow but as the cut never healed properly and he was found with bandages around his head, it is very probable that he died of a fractured skull. Conversely two women who had fractured skulls, one after a blow to the face and the other after blow to the back of the head, both survived their injuries.

One young man had apparently survived numerous battles as there were many healed cuts on his cranium. On top of this he must have suffered from unbearable toothache. Dentist Niels Brøndum has demonstrated that there were 16 individual sites of caries on his teeth of a type which today is found amongst bakers. Cavities in teeth were not common in the Middle Ages. Judging by his injuries he could have been a mercenary who also indulged his sweet tooth. It was in the middle of the 1400's onwards that sugar from the Azores was introduced into the better circles in Europe.

In general the doctors conclude that the inhabitants of Svendborg lived well, a conclusion which is supported by the zoological and botanical analyses. This would certainly explain the apparent decline in height and the standard of health evident in the centuries after the Reformation in Denmark. The Medieval population's attitude to personal hygiene and nutrition was obviously quite different from that which has been assumed up until now. In connection with this we only need to consider the many bath houses which had to be closed hastily when syphilis spread like lightning across Europe during the first decades of the 16th century.

BOTANICAL ANALYSIS

As early as 1979 Hans Arne Jensen was able to present his pioneering work on material from the first years investigations in Svendborg in volume 2 of *The Archaeology of Svendborg*. This work has since been continued by others including Grethe Jørgensen, who was the first person in Denmark to investigate human fæcal residues from latrines and who similarly reported her findings in volume 4 of *The Archaeology of Svendborg*. From the botanical analyses it has been possible to show the presence of imported plants, particularly spices but also fruit and, for instance, walnuts from 13th century Svendborg, both carbonised and uncarbonised. Remains of houses destroyed by fire, latrines and other refuse often contain considerable numbers of seeds and fruits and in cooperation with a pollen analyst and a wood anatomist it has been possible to build a fairly complete picture of local, collected and imported plants with respect to their use by the human population and their domesticated animals.

Grethe Jørgensen has concentrated her activities on material from the extensive archaeological investiga-

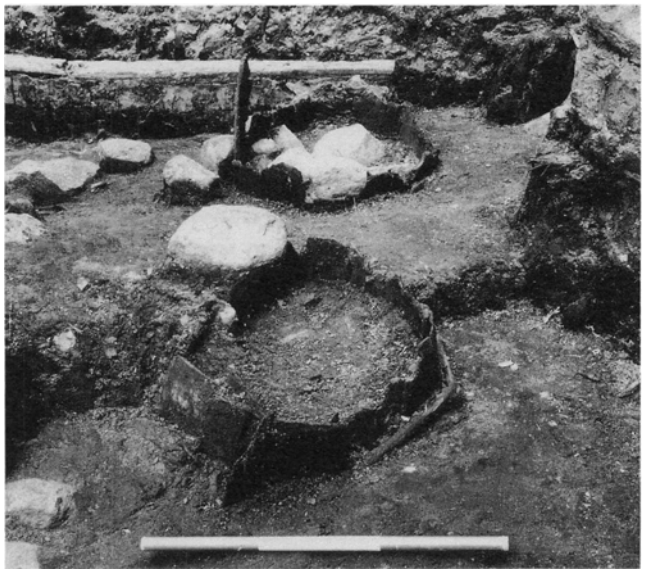

Fig. 8. Two latrines in a courtyard dated to the second half of the 14th century. The photograph was taken before excavation of the barrels. Note the stones 'sealing off' the barrel in the background. The smell persisted until they were reopened in the autumn of 1976.

Fig. 9. The excavation at Møllergade 6, Land. Reg. no. 607a. Note the well-preserved stone pavement. The houses are dated to 1308 and 1318, respectively, being built of both logs and staves. The wood was shaped at the large chopping-block at the stick used as scale near the centre of the picture. The chopping-block remained in its position surrounded with debris and wood shavings when a clay floor was laid on top of it. At the bottom of the picture a barrel with slaked lime is seen. Nearly all house-sites investigated had a barrel like this; seemingly the wooden houses were whitewashed.

tions which took place between 1976 and 1977 in Møllergade (Land reg. No 607a). The preservation was exceptionally good at this site and many artifacts manufactured of organic material were recovered, in particular wooden kitchen utensils (turned bowls and plates, barrel beakers, wooden platters, spoons, knives and distaffs) but also very many leather items, as well as the actual structural remains of the burnt buildings on the site. It perhaps should be pointed out that the plant remains which do not have a resistant testa or outer coat such as peas, beans, leaves and rootcrops could not be detected in this investigation. Furthermore account has to be taken of the possible sources of error in any statistical calculations which are made. Individual plants of certain species can produce considerable numbers of seeds or fruits, for example fat hen (*Chenopodium album*), sheep's sorrel (*Rumex acetosella*) and various of the persicarias (*Polygonum* sp). Imported figs (*Ficus carica*) can contain in excess of 400 seeds whereas a cherry (*Prunus* sp) is represented by a single stone (1).

In total Grethe Jørgensen recognized 164 different taxa in material from Møllergade and she added 3 new records to Hans Arne Jensen's already impressive list. These being, fig (as already mentioned), motherwort (*Leonurus cardica*), which as the latin name suggests can be used for heart ailments and cat-mint (*Nepeta cataria*) which was recommended in Medieval times as a treatment for adder bites. As would be expected many new plants were introduced to Denmark when monasteries were established over the whole country. Mediterranean plants such as dill (*Anethum graveolens*), bishop's weed (*Aegopodium podagraria*) and cummin (*Carum carvi*) together with other monastery plants, such as cabbages and celery, quickly became part of the daily diet. Bishop's weed which now plagues all gardeners was popular as a kind of spinach but could also be used as a laxative, just as cummin was recommended for flatulence brought on by eating too much rich food. The presently popular spice coriander (*Coriandrum sativum*) was good for expelling wind and also helped the digestion. Even cultivated apples and pears were available thanks to the gardening-loving monks. It was first in the 1300's that the inhabitants learnt how to lay out orchards and herb gardens for themselves.

As already mentioned Grethe Jørgensen also analysed the contents of a latrine barrel that was recovered from a layer dated to between 1350 and 1400. From these analyses she could, one might say, take a back-

ward look at the contemporary menu. One result of this work was the earliest Danish record of sour cherry (*Prunus cerasus*). Amongst the many medicinal plants, mention should be made of the ubiquitous chicory (*Cicorium intybus*), the leaves of which are recommended as healthy fodder for both people and animals but which could also be used against melancholia, hypochondria, consumption, piles and gout. Also revealed were remains from plants used in beer brewing: bog myrtle (*Myrica gale*), hops (*Humulus lupulus*) and of course barley (*Hordeum vulgare*). From about 1200 onwards German introduced hop beer became the most popular in Denmark and hops are found in all layers above the level of the barrel. It was again the monks that were the teachers in this respect. Hops were also thought to be active in reducing male sex-drive, probably a reason for why they were so popular in monastery gardens.

Seeds of flax (*Linum usitatissimum*), hemp (*Cannibis sativa*) and gold of pleasure (*Cammelina sativa*) are all rich in oil. The two former are also known as sources of fibres that can be spun to make textiles and ropes. In this case however it appears that all three had clear medical applications. The narcotic effects of hemp, so well known in later times, come from resin that is secreted from glandular hairs on the female plants.

For the sake of completeness the four species of moss found in the barrel should be mentioned. They answer the question regarding what could have been used as toilet paper in Medieval times. *Climacium dendroides* was collected from damp grassland, whereas *Hypnum cupressiforme*, *Neckera complanata* and *Antitrichia curtipendula* were taken from tree trunks and stones.

A sample of grain that was found in a hearth dated to the period 1308–1318 contained c. 13000 grains of barley, c. 1100 grains of oats (*Avena sativa*) and 17 grains of rye (*Secale cereale*) as well as seeds and fruits of flax, hemp, gold of pleasure and many weed species including corncockle (*Agrostemma githago*). As the grain had sprouted it is likely that the find represents grain left to germinate as a preliminary to brewing beer, that is home-brewing, even though all the cereals and the other plant remains for that matter were present in the latrine material in the barrel. Maybe the finding of sprouted barly grains on a hearth suggests that they were being roasted as the next stage in preparing the malt.

The reason that testa (seed coat) fragments of corncockle but only the chaff (glumes, lemmas, paleas and rachis segments) of cereals are present in the barrel is because the testa of corncockle is indigestable. Corncockle seeds also contain githagenin, a poisonous saponin, which is readily taken up in the digestive tract. The consumption of food such as bread and porage contaminated in this way and the subsequent poisoning which results, were not unusual in the Medieval community and in severe cases proved fatal.

In concluding this section it should be mentioned that Grethe Jørgensen also analysed samples of cattle dung that lay in the yard of the building in Møllergade. In particular the samples contained many seeds and fruits of late summer plants as well as species of grazed commons, damp pastures and carr. There were also large numbers of seeds and fruits of arable and wasteland weeds. Several samples of excrement from domesticated animals were given to Peter Nansen of the Royal Veterinary and Agricultural College, Copenhagen, for parasite analysis, but the results are not as yet available.

Plant macrofossil analysis of the very fine material from Møllergade, which spans the periods 1150–1600, is not yet completed. Jan van Dijk of the University of Copenhagen is working on a series of samples from the layers which accumulated in the yard during this period. His results will be included in a later publication.

WOOD ANATOMY AND DENDROCHRONOLOGY

It is pioneering work which will be recounted in this summary, a great effort on the part of Thomas Bartholin which has contributed many new aspects to our knowledge of life in the Middle Ages. Thomas Bartholin has examined all the preserved wood that was recovered from excavations in Svendborg during the period 1972–1980. His analyses are not however completed yet due to lack of funds for the final stages of the work. The material from Svendborg provides an important link in an evaluation of:

a) the development of the vegetation and landscape

b) the town

c) trading and

d) the history of the vegetation for the western Baltic in the period 700–1700, where Hedeby covers the period 700–1000, Slesvig covers the period 1000–1200,

Fig. 10. Barrel-beakers of common spruce and with osiers of willow found in layers dated to c. 1300 at the site Møllergade 8, Land Reg. no. 607a.

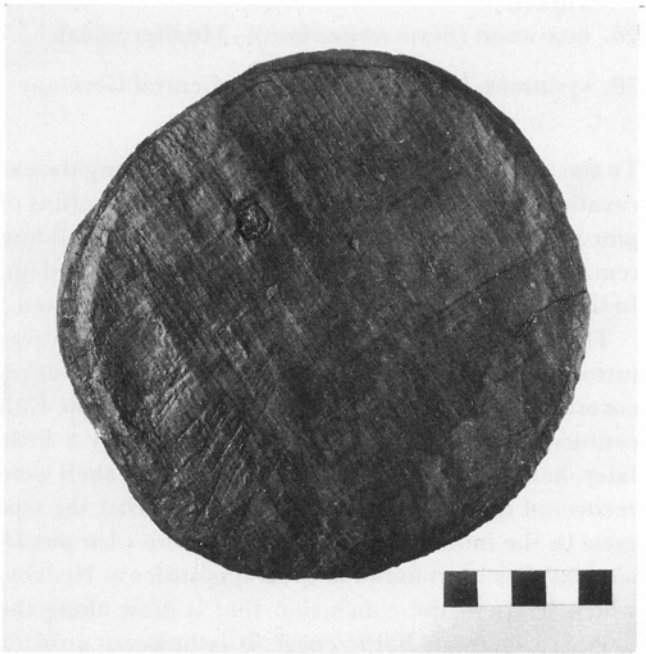

Fig. 11. Wooden platter or trencher of beech found in layers from the 14th century.

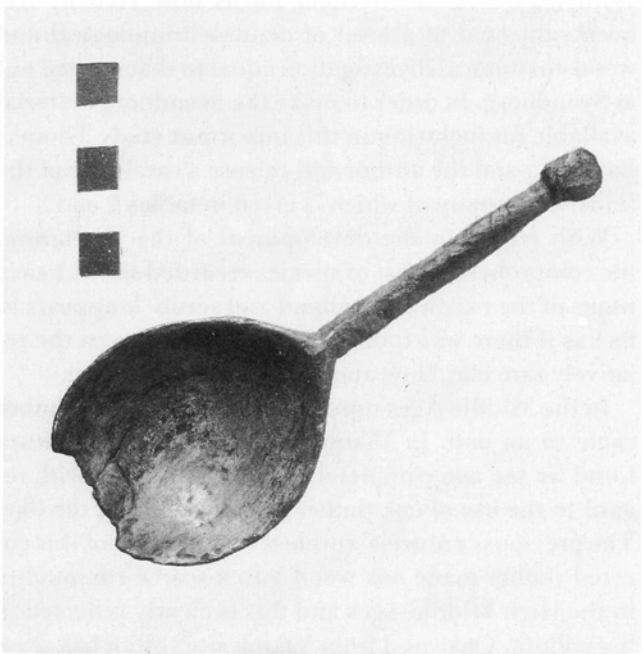

Fig. 12. Ladle of sycamore found at the bottom of a well from the 15th century.

Fig. 13. Turned soup-plate of alder found in layers of the 12th century.

Svendborg covers the period 1200–1500 and Lübeck covers the period 1500–1700.

With regard to the German towns only Hedeby has been subjected to a level of dendrochronological and wood anatomical investigation equal to that carried out at Svendborg. In order to make the Svendborg material available for inclusion in this important study Thomas Bartholin and the author will release a catalogue of the finds, a summary of which is given in tables 2 and 3.

With regard to the development of the vegetation, the comprehensive list of species recorded shows heavy usage of the existing woodland and scrub. It appears in fact as if there was total exploitation, with even the relatively rare elm, lime and willow being included.

In the Middle Ages unrestricted access to oak timber came to an end. In Viking Hedeby and 11th century Lund we see two completely different pictures with regard to the use of oak timber in buildings and the like. The previous centuries' ruthless exploitation of this coveted timber made oak wood into a scarce commodity in the High Middle Ages and this is clearly reflected in Svendborg. Oakwood from Viking sites often has several hundred annual rings whereas in Svendborg it is very rare to come across timber of such dimensions. There simply was not time to wait for oak trees to reach the proportions of earlier times. Despite this it has been possible for Thomas Bartholin to construct a standard curve for the dendrochronological dating of oakwood from Svendborg and this has been of invaluable assistance in mapping the development of the Medieval town.

The identification of wood on the basis of its anatomy can also give information regarding trade in timber. According to Bartholin, in table 2–3, species 3–6, 9, 15, 17, 26 and 30 are imported. Their nearest natural occurences are as follows:

3. silver fir (*Abies alba*) – Germany – Poland
4. common spruce (*Picea sp.*) – Central Germany
5. spruce or larch (*Picea* or *Larix sp.*) – Central Germany
6. Scots pine (*Pinus sylvestris*) – Central Sweden, Germany, Poland
9. walnut (*Juglans regia*) – Mediterranean
15. sweet chestnut (*Castanea sativa*) – Mediterranean and possibly other wine growing areas
17. bog myrtle (*Myrica gale*) – Jutland (probably also Funen)
26. box-wood (*Buxus sempervirens*) – Mediterranean
30. sycamore (*Acer pseudoplatanus*) – Central Germany

To the above list it should be added that during the excavations of the Franciscan churchyard some coffins of pine were found. Similarly in the late Medieval building remains, building timber of the same type cropped up. In both cases it is likely that the timber was imported.

There is great interest regarding walnut which was introduced by the monks. A chip of walnut wood was recovered from matr. no. 449a in a layer dated to the 13th century and from the same century, possibly a little later, half a walnut shell plus a whole green shell were recovered on matr. no. 607a. This shows that the tree grew in the immediate vicinity. Sycamore (*Acer pseudoplatanus*) has been found in great quantities at Hedeby, which leads to the conclusion that it grew along the northern German Baltic coast. It is however unlikely that it spread to Fyn, in that it was first introduced onto the estate of Brahetrolleborg of Opperman around the

Artifact categories:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total
1. *Taxus (baccata)*, yew								1	4	14		1														20
2. *Juniperus (communis)*, juniper										2																2
3. *Abies (alba)*, silver fir		1					1				1															3
4. *Picea (abies)*, Norway spruce	1	570								1		1										4				574
5. *Picea* or *Larix*, spruce or larch																										0
6. *Pinus (silvestris)*, Scots pine	1									2		3						6				3				16
7. *Populus sp.*, poplar			1														1				1					3
8. *Salix sp.*, willow						1			2		5	3					1				1			1		14
9. *Juglans (regia)*, walnut																								2		2
10. *Betula sp.*, birch																									8	8
11. *Alnus (glutinosa)*, alder	3		162	18	6				1	4		12					13	1			16	8		28		272
12. *Carpinus (betulus)*, hornbeam																								2		2
13. *Corylus (avellana)*, hazel						5			10	62	5	23							4		7	5		44		165
14. *Fagus (sylvatica)*, beech	13		3	3	1		2	1	3	16	4	39					14	16	3	2	21	6		97		244
15. *Castanea (sativa)*, sweet chestnut																										0
16. *Quercus sp.*, oak	51		1	1					2	9	4	19					111	29	6	3	29	14		21		300
17. *Myrica (gale)*, bog myrtle																										0
18. *Ulmus sp.*, elm										1							1							2		4
19. *Pomoideae*, apple family			1						1		1	1					1				4			1		10
20. *P. cf. Crataegus sp.*, cf. hawthorn			1				1																			2
21. *P. cf. Sorbus sp.*, cf. rowan			1							1	1	1									1			2		7
22. *Prunus sp.*, plum, cherry etc.											1															1
23. *cf. P. spinosa*, cf. sloe										4																4
24. *Rosa sp.*, rose																										
25. *Ribes (uva-crispa)*, gooseberry																										
26. *Buxus (sempervirens)*, box								3																		3
27. *Acer sp.*, maple family			15	2	1		5					2														25
28. *cf. A. platanoides*, cf. Norway maple			2				2															1		1		6
29. *cf. A. campestre*, cf. field maple	1		1	3			1				2	1														9
30. *cf. A. pseudoplatanus*, cf. sycamore			5	1	1	1	4		1																	13
31. *Tilia sp.*, lime										1											1					2
32. *Fraxinus (excelsior)*, ash	1		16	5	1		1			2		11					3	2			1			5		48
33. *Euonymus (europaea)*, spindle tree						4	12			47	6	1														70
34. *Rhamnus (cathartica)*, buckthorn												1														1
35. *Sambucus (nigra)*, elderberry						2	7		1	19		3												3		35
36. *Lonicera (periclymenum)*, honeysuckle																										0
Total	71	572	209	33	10	13	36	5	26	184	30	122					145	54	13	5	82	38		209	8	1865

Table 2. Determinations of 1865 wood samples from the excavation at Møllergade, Land Reg. no. 607a. Numbers above refer to functional categories, see key to tables 2–3.

Artifact categories:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total
1. *Taxus (baccata)*, yew								1	4	20		1								1						27
2. *Juniperus (communis)*, juniper										2																2
3. *Abies (alba)*, silver fir		1					1				1															3
4. *Picea (abies)*, Norway spruce	1	624								1		4	53	1		4		3	11			1		4		707
5. *Picea* or *Larix*, spruce or larch												1														1
6. *Pinus (silvestris)*, Scots pine	1	1								2		10	108			28		14	91			5		3		263
7. *Populus sp.*, poplar			1									4					1				1		1	15		23
8. *Salix sp.*, willow						1			4	1	15	12		13			1	1	8		2	2		20		80
9. *Juglans (regia)*, walnut																								3		3
10. *Betula sp.*, birch												1										4			8	13
11. *Alnus (glutinosa)*, alder	3		171	19	11				1	4		34	3	9			13	3		1	21	101		153		547
12. *Carpinus (betulus)*, hornbeam									1															2		3
13. *Corylus (avellana)*, hazel						5			10	72	19	50		211	2				48	28	8	41		127		621
14. *Fagus (sylvatica)*, beech	78		3	3	2		2	2	3	17	4	250	6	4			14	126	5	126	81	33	13	461		1233
15. *Castanea (sativa)*, sweet chestnut											14															14
16. *Quercus sp.*, oak	90		1	1	1				3	9	4	252	3	3			120	77	8	6	79	114	3	106		880
17. *Myrica (gale)*, bog myrtle																								1		1
18. *Ulmus sp.*, elm									1					4			1				1			5		12
19. *Pomoideae*, apple family			1						1		1	2					1				6			35		47
20. *P. cf. Crataegus sp.*, cf. hawthorn			1		1		1		1		1	4							4			1		2		16
21. *P. cf. Sorbus sp.*, cf. rowan			1							1	1	3									1	1		9		17
22. *Prunus sp.*, plum, cherry etc.											1			4					4			4		8		21
23. *cf. P. spinosa*, cf. sloe										4														8		12
24. *Rosa sp.*, rose											4													2		6
25. *Ribes (uva-crispa)*, gooseberry																								13		13
26. *Buxus (sempervirens)*, box								3																		3
27. *Acer sp.*, maple family			19	2	2		5				1	3										1		3		36
28. *cf. A. platanoides*, cf. Norway maple			4				3					5		1								1		3		17
29. *cf. A. campestre*, cf. field maple	1		1	3			1				2	3												1		12
30. *cf. A. pseudoplatanus*, cf. sycamore			6	1	1	1	6		1			1								1						18
31. *Tilia sp.*, lime										1											1					2
32. *Fraxinus (excelsior)*, ash	1		18	5	1		1		3	2		79		10			3	2	7		10			9		151
33. *Euonymus (europaea)*, spindle tree						4	12			54	6	3							2	1				1		83
34. *Rhamnus (cathartica)*, buckthorn												1														1
35. *Sambucus (nigra)*, elderberry						2	7	1	1	19		6									2			18		56
36. *Lonicera (periclymenum)*, honeysuckle																								1		1
Total	175	626	227	34	19	13	39	7	34	209	74	729	173	260	2	32	154	226	188	164	213	309	17	1013	8	4945

Table 3. Determinations of 4945 wood samples from the excavations 1972–80, all localities. Numbers above refer to functional categories, see key to tables 2–3.

year 1800. Yew (*Taxus baccata*), in Bartholin's opinion, may have grown in the Svendborg area. Several of the so-called 'pølse-' or 'spilepinde' (skewer-like artefacts) of yew have been recovered and their function is not completely clear. It was thought that yew became extinct in Denmark much earlier than this.

In conclusion it should be mentioned that where there are large quantities of oak and common spruce recorded in the two tables it is due to the fact that during the excavations oak wood was collected preferentially for the purposes of dendrochronology and the many fragments of barrel-beakers were collected because Thomas Bartholin needed this wood type for his comparative analysis of material used to make these items. In nearly all cases they are thought to be made of common spruce.

Again it is the fantastic preservation in the rubbish layers which allows description of the above wood and the identification of its use in building, tools and household effects. Here the cooperation between archaeologist and wood anatomist resulted in many new and original contributions to both our picture of Medieval life and of contemporary trade in timber as a raw material or as a half-finished product.

More about this will be published in the projects English language series *The Archaeology of Svendborg* as will the analyses of the many leather finds carried out by Professor Willy Groenman van Waateringe of Amsterdam University. In connection with this I would like to invite all those interested to become involved in further work on the material recovered from the excavations which have taken place over the years in medieval Svendborg. Every assistance in this respect would be welcome.

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Key to tables 2–3

1. Staves, lids, and bungs of the barrels and vats
2. Staves and bottoms of 'stavbægre'
3. Carved and turned bowls
4. Carved and turned plates
5. Other turned wood
6. Distaffs
7. Spoons
8. Knife handles
9. Other tools: Leisters, arrows, brooms, thimbles, etc.
10. Various pointed sticks
11. Other articles: Rosary beads, gaming pieces, bindings, etc.
12. Worked wood with an unknown function
13. Coffin planks/boards
14. Bars and ribs in the coffins
15. Hazel rods in the coffins
16. Wood shavings in the coffins
17. Building timber
18. Planks and boards
19. Pegs, rivets, and dowels
20. Wedges in pegs, rivets, and dowels
21. Posts
22. Other structural timber (from gullies, wells, water-pipes and the like)
23. Tree trunks
24. Wood chips, branches, charcoal, nuts etc.
25. Bark

Animal Bones from Svendborg

by TOVE HATTING

The many excavations which together make up the Svendborg project have produced an immense amount of bone material which primarily stems from midden layers containing kitchen refuse. The analysis of this material is not yet completed in that only material from Land reg nos 449a, 482, and the Franciscan Monastery is sorted and identified. Sorting of the material from matr. no 607a and Ørkild castle is finished but only the mammals are identified to species from the latter. The finds from Ørkild are extensive and are in the process of being registered on computer, so the final fragment totals are not yet available. Similarly the fish bones are not identified from this excavation. The main body of the bone material is made up of domesticated animals, which were the basis of the population's diet. It is obvious from the list of species however (tables 4–6) that fishing and wildfowling also contributed, whilst hunting of the woodland animals was reserved for the occupants of the castle.

The largest part of the material is made up as usual of cattle bones thanks largely to their size and robustness. The smaller species, such as pig and sheep, are however also so well represented that they too must have played an important role in the domestic economy. Pigs in particular made up a large part of the diet at Ørkild. An analysis of the age distribution of sheep jaw bones has

Mammals	Land Reg. No. 449a	Land Reg. No. 482	Greyfriars Monastery	Ørkild Castle	Land Reg. No. 607a
Domesticates					
Dog (*Canis familiaris*)	4	25		126	x
Cat (*Felis catus*)	9	17		109	x
Pig (*Sus domesticus*)	222	731	216	2054	x
Goat (*Capra hircus*)	1	7	2	20	x
Sheep (*Ovis aries*)	208	881	148	670	x
Cattle (*Bos taurus*)	385	1806	618	2297	x
Horse (*Equus caballus*)	2	6		12	x
Non-domesticates					
Hedgehog (*Erinaceus europaeus*)				1	
Hare (*Lepus europaeus*)	1	9		14	x
Squirrel (*Sciurus vulgaris*)					x
Black rat (*Rattus rattus*)				3	
Fox (*Vulpes vulpes*)	1	1		36	x
Otter (*Lutra lutra*)					x
Seal (*Phoca sp.*)	1				x
Roe deer (*Capreolus capreolus*)	1	2	2	51	x
Red deer (*Cervus elaphus*)	2			55	x
Fallow deer (*Dama dama*)				61	x
Porpoise (*Phocaena phocaena*)				1	x
Man (*Homo sapiens*)		118		1	x

Table 4. Summary of bone material: mammals.

Birds	Land Reg. No. 449a	Land Reg. No. 482	Land Reg. No. 607a
Red-throated diver (*Gavia stellata*)			x
Swan (*Cygnus sp.*)	x	x	
Whooper swan (*Cygnus cygnus*)			x
Mute swan (*Cygnus olor*)			x
Bean goose (*Anser fabalis*)			x
Mallard (*Anas platyrhynchos*)			x
Pochards (*Aythya sp.*)	x		x
Pochard (*Aythya ferina*)		x	
Tufted duck (*Aythya fuligula*)		x	x
Scaup (*Aythya marila*)			x
Goldeneye (*Bucephala clangula*)			x
Common scoter (*Melanitta nigra*)			x
Velvet scoter (*Melanitta fusca*)		x	
Goosander (*Mergus merganser*)			x
Red-breasted merganser (*Mergus serrator*)	x	x	x
Osprey (*Pandion haliaetus*)			x
Sea eagle (*Haliaeetus albicilla*)		x	x
Great black-back gull (*Larus marinus*)			x
Razorbill (*Alca torda*)		x	
Raven (*Corvus corax*)		x	x
Carrion or hooded crow (*Corvus corone*)			x
Rook (*Corvus frugilegus*)			x
Jackdaw (*Corvus monedula*)			x

Table 5. Summary of the bone material: birds.

Fish	Land Reg. No. 449a	Land Reg. No. 482
Herring (*Clupea harengus*)		x
Salmon (*Salmo salar*)	x	
Pike (*Esox lucius*)		x
Carp family (*Cyprinidae*)	x	x
Eel (*Anguilla anguilla*)		x
Garfish (*Belone belone*)		x
Cod family (*Gadidae*)	x	x
Cod (*Gadus morhua*)	x	x
Haddock (*Melanogrammus aeglefinus*)	x	x
Ling (*Molva molva*)		x
Perch (*Perca fluviatilis*)		x
Mackerel (*Scomber scombrus*)		x
Sea scorpion (*Cottus scorpius*)		x
Brill/turbot (*Scopthalmus sp.*)		x
Plaice/flounder (*Pleuronectidae*)	x	x

Table 6. Summary of bone material: fish.

	Spur	Total length	Proximal width
left	cutmarks	81,2	14,2
	scar	77,9	12,6
	cutmarks	76,9	13,4
	sp.	76,5	13,8
	cutmarks	75,0	13,7
	scar	74,4	14,0
	cutmarks	73,3	13,7
	scar	71,9	14,0
	sp.	71,3	13,8
	÷	66,2	11,5
	÷	65,0	12,2
	÷	62,6	11,1
	÷	62,0	12,3
	÷	61,2	11,3
	÷	61,9	12,4
	÷	59,6	12,0
right	scar	80,6	13,8
	cutmarks	78,8	13,3
	scar	76,1	12,9
	scar	74,4	13,3
	scar	71,1	13,6
	cutmarks	68,9	15,4
	÷	68,9	12,2
	÷	67,9	11,9
	÷	66,1	11,6
	÷	59,7	11,0

shown that in Svendborg sheep were preferentially slaughtered as lambs and very few animals were allowed to grow old. In corresponding material from Medieval Viborg both young and old animals were slaughtered, whilst in iron age Ribe it was mostly older animals which were represented. Apparently in Viborg, all aspects of the sheep were exploited, whereas in Ribe they were kept specifically for wool production. This idea is supported by the finding of many loom weights and the textile finds, although these are few, suggest local textile production (Lise Bender Jørgensen, in press). In contrast, sheep were kept in Svendborg primarily to produce tender young meat.

Another indication that the people of Svendborg set great store by their food can be seen in the poultry remains from Land reg. no 607a. During a routine examination of domesticated fowl bones the metatarsal bones (*tarsometatarsi*) were sorted out for the purposes of sex and size determination (fig. 14). As a rule in the female (hen) only the scar at the junction with the lateral toe is visible on the bone, whilst in the male (cock) there is in addition the body process which bears the spurs. The presence of this bony process has usually been taken as a reliable indicator of sex, but according to Coy (1985) and others, it is not quite so clear cut after all, in that old hens can have rudiments of spurs (spur scars). In addition, it was known as early as the Roman Iron Age how to produce capons (castrated cocks), something which influences the spurs as they are a secondary sexual character. In birds, the testicles are not, as in the case of mammals, positioned on the outside of the abdomen, but lie at the rear of the abdominal cavity and it is a very difficult operation to destroy them. Pliny and Aristotle describe how to castrate male chickens by inserting a red hot iron into the abdominal cavity, not always with successful results (Aldrovandi: Lind 1963). Another method is described by Columella in the 1st century A.D. (Ghigi, 1939) whereby only the spurs are burned away, again using a red hot iron. This results in the bird losing the ability to fight and it is therefore excluded from the pecking order. Castration by these methods could bring about changes in the development of the spurs which would be reflected in the bone mate-

Table 7. Measurements of the metatarsal bones of domestic Fowl (Gallus domesticus). The bones were recovered at the site Land Reg. no. 607a in Svendborg. – Sp. = undamaged spur. ÷ = female. Measurements in mm.

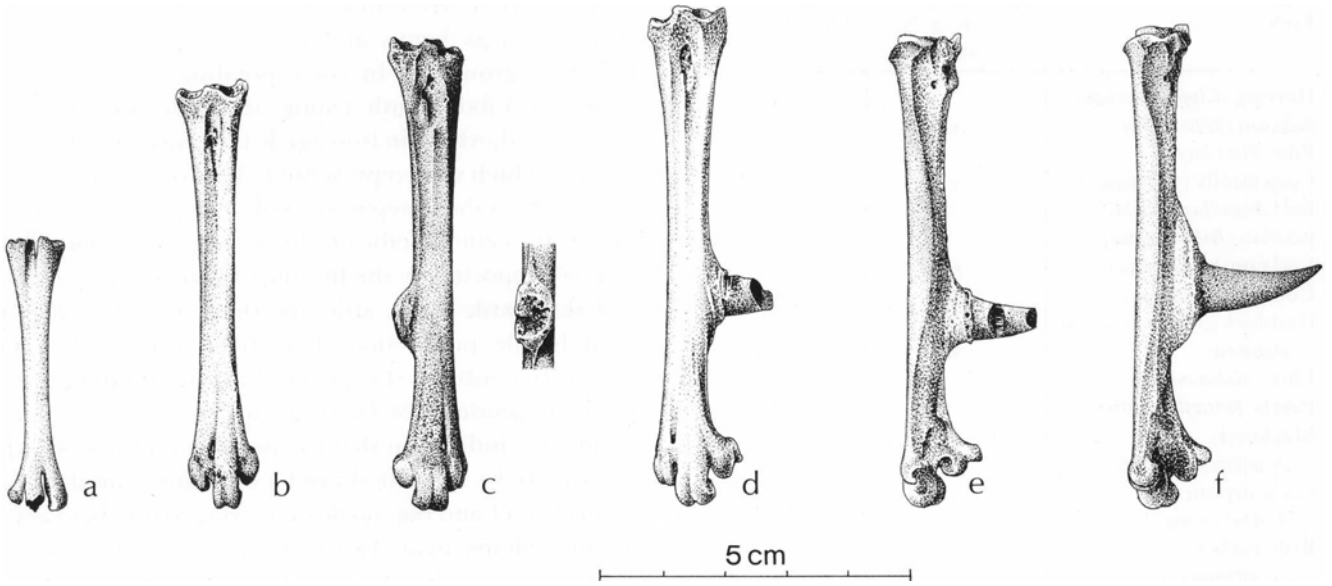

Fig. 14. Metatarsal bone of domestic fowl (Gallus domesticus). – a, chicken. b, hen. c, cock with scar. d–e, cock with cutmarks. f, cock with undamaged spur. Robert Nielsen del.

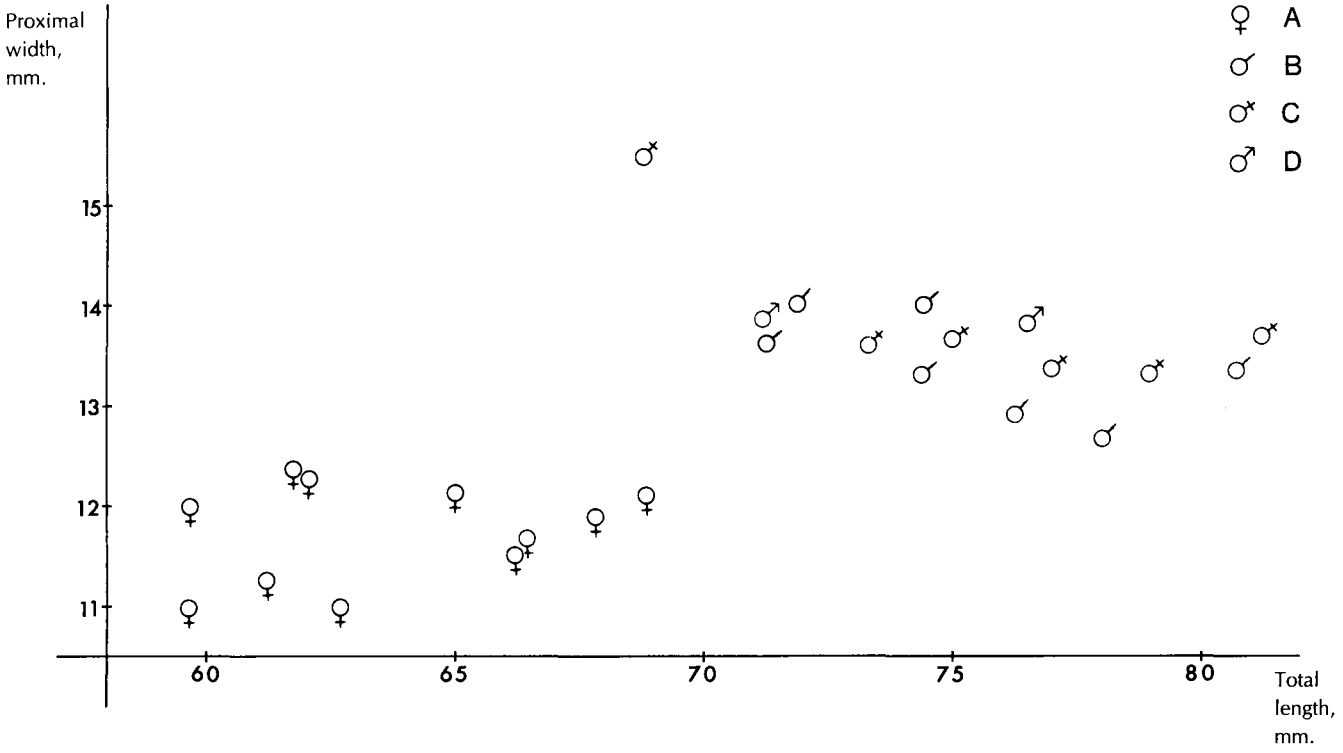

Fig. 15. Metatarsal bone of domestic fowl (Gallus domesticus). Signatures: a, hen. b, cock with scar. c, cock with cutmarks. d, cock with undamaged spur.

rial. Unfortunately suitable recent reference material is lacking.

A total of 72 middle foot bones were recovered from the Svendborg material. Of these 22 were from young birds or chickens and 20 were clearly from hens in that they showed no sign of spurs. There were a further 27 bones bearing spurs of which 7 were whole and undamaged (table 7). Of the others, 9 bore scars, of which several could be interpreted as being the result of the spur having been burned off. Finally, clear cutmarks were visible on the remaining 11 pieces which may have been the result of the removal of the spurs. This phenomenon could signify that a simpler method of producing capons was chosen. In comparison, 30 metatarsal bones were recovered from the Medieval layer in Søndervold in Århus, of which 14 were without spurs. Of the remaining 16 only 2 showed cutmarks, whilst 4 had scar tissue. From a contemporary but smaller body of material from Sct. Pedersstræde in Viborg, 4 metatarsal bones were recovered, of which 2 had whole spurs and one showed scar formation.

The very large percentage of damaged spurs in the Svendborg material could signify that fat capons were prized particularly highly. It could be that in addition to castrating chickens, they were force-fed prior to slaughter but such a practice would not be reflected in the bone material.

As a matter of interest it should be mentioned that spurs are removed from cocks for a purpose far removed from that described above, namely that of raising fighting cocks. Several classical authors mention that cock fighting was indulged in on the Greek Islands and that to equalize the birds the natural spurs were removed from the combatants and artificial spurs of iron or bronze were fitted. In more recent times at Greyfriars in Oxford examples of metatarsal bones with the spurs cut off are known which correspond exactly to the Svendborg examples (West 1982) just as there are stuffed specimens of fighting cocks with spurs removed and artificial ones fitted. However the fact that for the moment nothing that could be interpreted as artificial spurs from the Middle Ages has been found in Svendborg or elsewhere in Denmark, could be taken to mean that spur removal was purely for the purpose of producing capons.

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Pollen Analysis in and around Svendborg

by INGRID SØRENSEN

In recent years archaeologists and historians have sought help from many branches of the natural sciences in reconstructing daily life in a medieval town. The understanding of how useful this can be has increased in step with the results which have been produced and even though it must be acknowledged that is has not always been possible to give specific answers to specific questions, further investigations do result in the broadening of experience and provide results which can be the basis for comparison.

Obvious methods in investigations of the natural environment that the people of the town lived in and the natural resources which they doubtlessly exploited are plant macrofossil and pollen analysis of the culture layers. Samples for botanical analysis were collected from all excavations in Svendborg and although the analyses are far from complete, a number of results have already been published.

There are however problems in using this kind of material, stemming largely from the fact that the deposits are for the most man-made rather than naturally accumulating. With regard to plant macrofossils (seeds, fruits and the like), they could have originated from plants growing on the spot or they could have been brought in by people or their domesticated animals. The situation regarding the pollen content of the culture layers is rather more complicated, in that the pollen could have originated anywhere in the area and have been transported to the site on air currents. So despite the fact that the pollen analyses show a greater spectrum of the region's vegetation, the results are difficult to interpret.

In order to investigate these problems further, the pollen analytical investigations from Svendborg have been divided into two parts. From the culture layers in the town, the same samples as used by Grethe Jørgensen and Hans Arne Jensen for plant macrofossil analysis are being analysed, partly in order to compare macrofossil and pollen content, but also because a number of seeds can be determined to species level whereas the pollen analyst is forced to give up at the

level of genus or even family. Of equal importance are the pollen analyses from natural deposits, partly from the town moat and partly from a valley called Dronningmaen, an area which in medieval times lay outside the limits of the town. It is this part of the investigations that will concern us in the following.

Dronningmaen is a long crack-like valley running along the northern edge of Svendborg and was considered well-suited to the project. The investigation of an open profile on the southern side of the valley in 1974 gave surprising results however. In contrast to the natural development of a lake basin, where gyttja formed under open water gives way to peat as the lake becomes overgrown, here the peat was overlain by almost 40 cm of gyttja. This situation could only have arisen from a marshy area having been flooded and then standing under open water. It seems likely that the construction of a dam in order to create a mill pond was responsible and this idea is supported by the fact that since the Middle Ages there have been mills sited at the point where the supposed narrow outlet to Svendborg Sound was located.

Radiocarbon dating of the peat a few centimetres below the boundary with the overlying gyttja, gave a date of 1050±70 bp, calibrated to 950 AD. The uppermost layer of peat, which comes in contact with the gyttja, was not dated because phytoplankton from the dammed-up water had found their way into the peat and the dating would consequently have been too young. As can be seen in figure 16, which shows the upper part of the profile up to the level of the recent made ground, the peat has not accumulated at a steady rate (the peat at this point is 156 cm thick and peat formation began c. 6000 BP uncalibrated, the dates given in brackets are calibrated). However despite the irregular sedimentation and the uncertainties which surround conventional and calibrated radiocarbon dates from peat, such that these must be taken as guidelines rather than absolute dates, it is probable that that damming of the valley took place in the 11th or 12th century.

The resulting deposit is a fine homogeneous gyttja, containing seeds and fruits as well as pollen of aquatic plants. For such a deposit to accumulate requires at least 2 metres depth of water. It would be no mean feat of engineering to produce a mill pond of this order and it presumes the availability of considerable economic resources. From a topographical point of view the site was optimal for the creation of a mill pond that could be used for a large-scale operation. A combination of a long narrow valley, which at the time of dam construction had an overgrown marshy floor, and a substantial input of water from the morraine hills along the valley side, made this an ideal site for the many mills which were constructed around the same time or later than the dam itself. Maybe it was this activity which provided the economic background for the foundation and development of the medieval town.

No remains of the original dam or the medieval mills have been found. They must have lain nearer Svendborg Sound than the mill which is known from Tullebrinke, where there are metre-thick deposits of gyttja resulting from the damming of the valley. Neither is it known when the mill-dam was breached. However, overlying the gyttja in the profile there is 4 cm of peat which has been compacted by the 150 cm thick layer of made ground which was added during the course of the

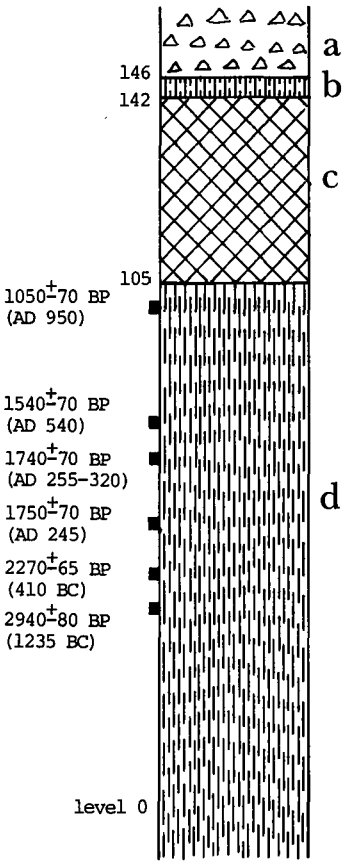

Fig. 16. Part of section in Dronningmaen with Carbon 14 dates. – a, sand. b and d, peat. c, gyttja.

present century. In the peat is pollen of bogbean (*Menyanthes trifoliata*), which means that for period Dronningmaen again became a marshy area.

The chalk-rich gyttja of the millpond cannot be radiocarbon dated and it has not been possible so far to find a basis for the dating of the pollen analyses of the gyttja. Accordingly it has not yet been possible to compare the pollen content of the gyttja with that of the contemporary culture layers in the town.

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NOTE

1. Nomenclature for flowering plants follows *Flora Europea* and for bryophytes (mosses) follows Nyholm (1954–69).

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