

## EGGS FROM EARLY SNEEK

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**ABSTRACT:** Refuse layers in the town of Sneek, dating from the 12th to the 17th century AD, contained pieces of eggshells. In some rare instances the tiny fragments of lapwing eggs were found in the 15–16/17th century deposits. Rubbish from a cesspit contained the fragments of a complete swan egg, which may have been eaten. Chicken eggs may have been brought in from farms outside the old town centre. The same is true for duck eggs but these may have originated also from the ‘town ducks’ which were kept on the canals.

Identification of the egg-producing species was achieved by measuring the thickness of the shell and comparing the outer shell structure under 81 times magnification. In addition, the colour of the shell was used as an identification trait. On several occasions it was found that half eggshells had been pushed into each other before discarding. These series of some 5–6 eggs could be a mixture of chicken and duck eggs.

**KEYWORDS:** Sneek, Medieval, eggshell, chicken, duck, swan, lapwing.

### 1. INTRODUCTION

In this paper eggshells from an excavation in medieval Sneek will be treated. Finds of eggshells in prehistoric or early historic excavations in the Netherlands are rare and have been published only occasionally. It is understandable that fragile objects such as eggs do not have much chance of surviving burial in accumulating deposits. Conditions of preservation must guarantee that the delicate object does not disappear in time. In aerated sandy deposits of the Pleistocene, which have generally low pH values, conditions are unfavourable for the preservation of calcareous shell.

It seems reasonable that the coastal mounds offer better conditions for the preservation of calcareous objects such as eggshells than the Pleistocene sandy soils. The pH in the clay deposits is often high and the presence of mussel and cockle shells clearly demonstrates conditions favourable for the survival of calcareous objects. Accumulation, which plays a role in preservation, is common in the coastal district but is seldom present in the Pleistocene sandy area. The find of complete eggs demonstrates that the weight of the accumulation affects the eggs less than one would expect (Elzinga, 1977; Keepax, 1981).

Information on early egg finds in Fryslân (northern Netherlands) is given by Elzinga (1977: pp. 585–594). Complete goose and chicken eggs have been reported from the coastal dwelling mounds (*terpen*). Several types of decoy-eggs of clay have been found on these Frisian sites. These consist of models of wild bird species and are evidence for earlier egg hunt-

ing. They represent models of eggs of Lapwing and Black-tailed Godwit. The Frisian name for such eggs is ‘*koai*’ and they are used to fool the parent bird and replace genuine eggs, which are taken away. The clay egg is accepted by the bird, which continues laying. When the clutch is complete, all bird eggs and imitation eggs are taken from the nest. Even in the 20th century the eggs of these meadow-dwelling birds were gathered and Lapwing eggs are still collected on a large scale.

The questions arising from the discovery of eggshells at Sneek focus on the identification of the bird species that laid the eggs and upon the possibilities of investigating how and why they ended in the refuse layers at the site.

The ‘life expectancy’ of eggshells in the open provides information about the length of time that exposed shell may survive. This concerns for instance eggshells that are the result of hatching. Such eggshells turn brittle during the incubation process. The egg is opened by the chick resulting in two parts, a bigger (pointed) part and a smaller (blunt) part. Between the two parts, a narrow strip that is shattered by the hatching chick is missing. The parent may remove the parts from the nest and even eat them. The latter action is explained as a way to hide the birth of the young birds, but also helps to replenish calcium especially in the female parent. For this reason, few eggshell fragments survive long above ground in the field. They are eaten by all kinds of animals. The shells of some hundred complete eggs that the first author annually throws away for various reasons (too old for consumption, selected as

infertile), attract wild birds, generally wood pigeons, which come to eat calcareous matter. Some eggshells, mainly of eggs from various goose species, which were broken by the rough handling, survive exposure in the field for more than one year although the soil on which they lay is rather acid. After some time in the open shells tend to become more brittle and those that are coloured tend to bleach due to exposure. Green in duck eggs, discarded in this way becomes lighter, and brown chicken eggs tend towards yellow. White eggshells, for instance of geese, may become stained with patches of green caused by algae growing on the shell. Nevertheless, it is clear that eggs exposed in the open never survive more than one year at the most.

Eggs or eggshells that are covered by sand also disappear. Survival is longer in dung or other wet organic refuse. Empty shells most probably have a greater chance than eggs with their natural contents. The latter category tends to rot and when unearthed in dung heaps explode like grenades on touch, because of pressure from the rotting contents.

The identification of eggshells depends very much upon the state in which they are found, the way they are preserved and the technical possibilities for investigation. There are various micro-morphological properties of eggshell fragments that can be studied, some with relatively simple tools, but for others the study is complicated and requires a scanning microscope and the necessary preparation of the object. The diagnostic value of the various morphological properties of the egg is not of the same level (for instance shape, size, colour, surface microstructure) and leads to several taxonomic levels of identification.

## 2. MORPHOLOGY AS A MEANS OF IDENTIFYING EGGSHELLS

The identification of bird eggs offers no serious problem where the egg is complete and displays its original colour. Identification is even easier when the egg is still in the original nest, preferably with its natural owners. It is obvious that archaeological remains of eggs lack many of these characteristics and in any case are rarely discovered by excavation. Parents and nest are absent, the egg is very seldom complete, the original colour may have disappeared and the shell fragments may have faded. Surrounding soil or dung may have stained the egg brown or black.

Some characteristics may however be preserved. The surface texture on the outside and inside may still be present. The inner and outer layers of the shell can be examined and details can be revealed under magnification.

Tyler (1964) gives detailed information about the inner surface, the mammillary layers and the membranes. The mammillary layer may be characteristic for groups of eggs but is not sufficient for the identification of species. The morphological description of the inner part of eggshells as is given by various authors cannot easily be checked by incident light microscopic observation, as this does not reveal the fine inner structure.

In describing the cuticle, Senhouse Pitman (1964) states: "The cuticle is a very variable structure, for in some birds (such as the domestic hen) it is a relatively simple layer, consisting mostly of organic matter, but in the Anatidae it has at least two layers, the outer one being calcified and powdery and the second one being chiefly organic in nature". This explains why duck eggs are so smooth compared to chicken eggs and this is what in practice the observer realises in distinguishing duck eggs from chicken eggs without knowing their morphological backgrounds.

Senhouse Pitman (1964) supplies information on the colour of the shell and the origin of such colour. The original colour and its distribution over the shell can be obtained easily from pictures in modern standard works as Makatsch (1976) or Cramp (1977–1994).

Usually literary sources deal only with the outer surface of chicken eggs (Tyler, 1964). Of importance are the striae found on the eggshells of domestic chickens. They can be more pronounced on part of the egg and less so in other areas but it is not easy to predict in which part they will be most dominant. Modern (chicken) eggs demonstrate a variety of patterns present on one egg. It is difficult to describe these surface structures and for this reason pictures of modern and archaeological eggshells are introduced in this paper. This method has clear limitations and it is not easy to identify eggs by means of the surface pattern when one has no idea which species may occur in the given circumstances. In the case of a medieval excavation the number of species responsible for the eggs is rather limited. However, one still has to prove this assumption.

The study of avian eggshell in connection with archaeology is discussed in detail by Caroline Keepax (1981). Keepax's work includes the study of prepared eggshell by means of a scanning electron microscope, allowing her to make very detailed pictures of the inner layer. Pictures of outer surfaces are shown at 44x magnification. The untreated outer surface of modern eggs differs from the archaeological eggshells in that the pores are mainly blocked (Keepax, 1981: figs 1d, e). Pores are the depressions that result from the end of the respiratory channels, which traverse through the calcite shell. In archaeological finds both surfaces have eroded so much that the pores become visible.

Some of the avian eggshells that Keepax studied were complete (Castle Acre Priory). Certain eggs are easy to identify from figure 4 in Keepax's paper. They are preserved so well that it can be concluded that the order in the picture disagrees with the order in the caption.

Keepax notes that modern eggs have fairly characteristic shapes and dimensions. Such properties, however, become less diagnostic when the size of the egg of chicken, duck, black-headed gull or coot are taken into consideration as they are of similar size. This is in fact true for all size classes that represent more than one species. Keepax stresses the tentative nature of the identification of archaeological material treated in her study.

One of the methods used by Keepax is to measure the thickness of eggshell (Keepax, 1981: fig. 5). Although it is a great advantage that the thickness of fragments can easily be measured it must be stressed that thickness in eggshells varies within the same egg. When an egg is broken, its fragments include a range of thicknesses.

### 3. THE EGGSHELLS FROM SNEEK

#### 3.1. Find conditions

Fragments of eggshells were found during an excavation in the *Martiniplein* (1998) of Sneek (province of Fryslân) under the direction of Mrs A. Ufkes. The excavated layers are ascribed to the mediaeval town and represent buildings and the backyard of a tannery. The period represented in the excavation stretches from the 12th to the 17th century AD. The eggshells were found in tanning pits, cess and refuse pits and wells in which kitchen refuse was also dumped as is demonstrated by the botanical macro-remains of various fruits and mussel shells.

Internal membranes are often preserved, possibly because of the moist and alkaline conditions. The leathery membranes often kept pieces of shell together. Some samples contain parts of several eggs and it was observed that originally half eggshells were discarded which have been pushed into other empty halves. This is a common way to deal with eggshells that have been left after the consumption of eggs. The finds in samples 5 (13th century) and 10 (15th–17th century) in particular point to this habit and in the latter sample up to five halves were pushed into each other. After cleaning and drying these fell apart into hundreds of fragments.

Most of the eggshells were collected by hand and a few samples by sieving. The finds were cleaned in the laboratory after re-wetting and notes were made about shapes.

The eggshells were mostly found in refuse that contained other organic matter, for instance seeds. These seeds are from fruits that were used for con-

sumption whereas the presence of seeds of halophytic plants points to the presence of saline meadows influenced by seawater (information R.T.J. Cappers).

The eggs from the excavation of medieval Sneek include 14 samples of broken shells, smaller and larger pieces.

#### 3.2. Colour

Some of the fragments are whitish but most of the eggs from Sneek show traces of colour. Various shades of light bluish-green and in one case light grass-green were found. Some samples show a rusty-brown colour and there are also tiny fragments that are mottled olive-brown with darker patches.

Original colouring needs to be distinguished from staining caused by other agents. Organic matter, when preserved amongst refuse, may eventually become stained with another colour. For instance, peat bodies clearly demonstrate this process with the artificial colouring of their skin and hair.

It appeared that the eggshells from Sneek had retained much of their original colour. Bluish-green eggs may have faded somewhat but the colour that was still visible was considered to be the original colour. In samples 10 and 11 (178a and b) shells with light-brown patches of colour are present.

Light blue-green or light yellow colours are common on duck eggs with a preference for bluish-green in wild duck eggs and yellowish for instance in Caki-Campbells (a domestic breed). This colour, nevertheless, is found not only on duck eggs but also in Araucana chickens, a breed developed in South America.

#### 3.3. Thickness

One characteristic not affected by fragmentation is the thickness of the shell. Modern eggshell shows variation in thickness within the same shell. As a reference the thickness of eggshells of call ducks (decoy ducks) of the size of a Mallard were measured. The thickness varied from 0.18–0.26 mm. The breed of *Assendelfter* chickens have eggs averaging 0.26 mm thickness.

Size classes based on variations in the shell thickness of the eggs from Sneek were identified. In figure 1 three main classes can be detected: a class with a thickness from 0.10–0.18 mm, a class from 0.21–0.37 mm and a class from 0.63–0.78 mm (fig. 1).

Finally, thickness, texture and colour were combined to identify the species of bird that produced the egg. By this means the second author found that the thinnest fragments had a distinctive colour belonging to another group of eggs than that, of for instance, chicken, duck or swan. Microscopic analysis of the small fragments revealed that they were

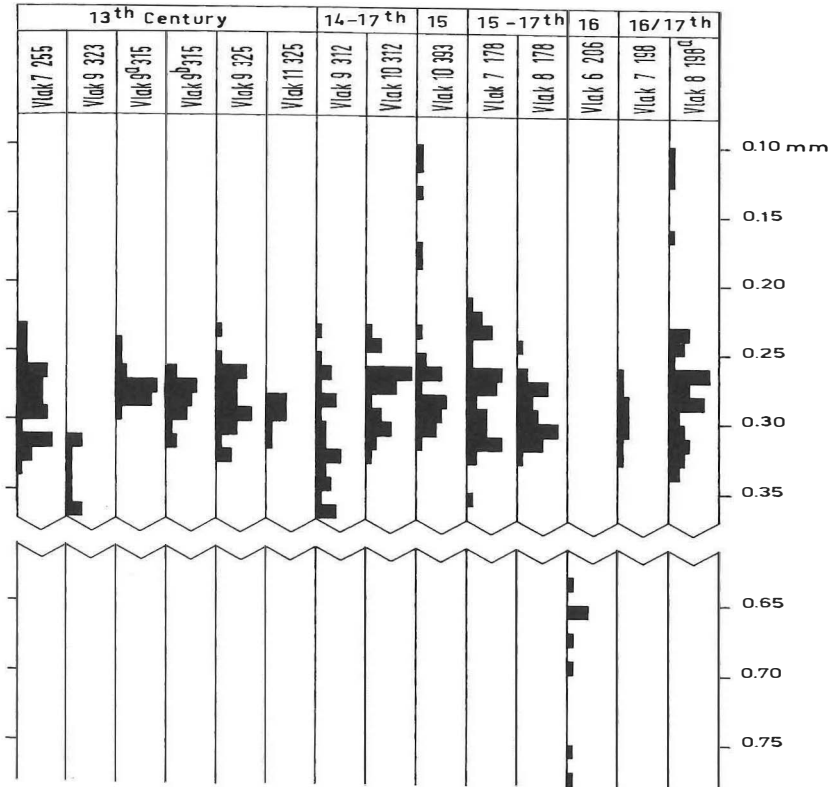


Fig. 1. Thickness of eggshells found in the Sneek excavation of the Martiniplein in Sneek, measured in mm and shown in relation to the 13th-17th century.

coloured buff with black spots. It is obvious that these fragments are from eggs of certain plover species nesting in the meadows, man made or natural saline grasslands (*kwelder*) forming the environment of early Sneek. These tiny fragments have the thickness and the colour pattern of Lapwing eggshells and it is reasonable to assume that they are from the eggs of this species, which were collected, eaten and the shells successively thrown in the offal pits. However, it is possible that eggs of the Redshank (*Tringa totanus*) could also have been collected. The Redshank (Frisian: *Tjirk*) is a common meadow bird, especially in saline meadows which occurred in the vicinity of Sneek. The microstructure of the surface of modern eggs of both species was studied for distinguishing characteristics.

#### 3.4. Dimensions and weights of modern egg shells

The dimensions and weights of modern eggs of Dutch wild birds are given by Hellebrekers (1950) and are used here for comparison. Colour pictures of eggshells are from Makatsch (1976).

For the comparison of surface texture and in particular the weight of chicken eggs, the eggs of the

*Fryske hinne* (Frisian chicken) were used. The *Fryske hinne* is a breed in the group known as the Hamburger chickens which lay white eggs. On the basis of osteological research in the coastal dwellings (*terpen*) it is assumed that the original farmyard chickens were similar in size to the *Fryske hinne*. The average weight of six of these eggshells is 5.16 gr (4.90-5.39 gr;  $N = 6$ ).

The weight of the eggshell of the Mallard, the common wild duck (*Anas platyrhynchos*) averages 4.47 gr, based on 97 specimens measured by Hellebrekers (1950). Because ducks in Sneek may have been kept either as a feral form in the town (see also Section 5) or on the farms in the neighbourhood, it cannot be excluded that the size of their eggs was somewhat larger than those of wild Mallards. Eggshells of the Mute Swan (*Cygnus olor*) weigh 38.81 gr on average ( $N=25$ ). Lapwing eggshells weigh 1.55 gr on average ( $N=100$ ).

#### 4. THE INVESTIGATION

Keepax's study of the inner microstructure (1981) gave no definitive key for the identification as the eggshells from Sneek were not prepared for scanning

and no reference material treated in this way was available.

The initial analysis of the medieval eggs was a visual examination of the texture and colour. Both the reference eggshells and the medieval fragments were studied under an incident-light, dark-field microscope at magnifications of 40, 80, 160 or 400 times.

The outside of the shell was examined. On the inner surface of the shell, the membranes, or part of them, were in some cases still connected with the shell.

The surface texture of the various kinds of eggshell at 100–400 times magnification under incident dark field illumination, also enabled us to check the result of identifying chicken from duck eggshells with the naked eye. An attempt was made to group the patterns and judge whether their characteristics could be used for the purposes of identification. The results were rather confusing.

Much better results were obtained by the analysing of pictures of eggshell surfaces with a Zeiss Axiocam digital photcamera through a STEMI SV 11 stereo-binocular microscope. Colour and black-and-white prints were made. With incident skimming light the magnified surface structure of the eggshell fragments became very clear.

The thickness of a representative number of Sneek eggshell fragments was measured and is shown in figure 1. The thickness of eggshell fragments was measured under 80x magnification with size classes of 10.8  $\mu$ . Membranes have mostly disappeared from

the small fragments. It must be emphasized that the degree of fracture plays a role in the shape of the curve of the thickness presentation in figure 1. For this reason pieces of about 0.5 cm in diameter were taken at random from each sample. The minimum and maximum thickness of the shell is the most informative aspect of the figure. For reference, figure 5 in Keepax (1981) is very useful.

The preliminary visual examination of the eggshell samples lead to four groups. Two groups were attributed respectively to duck and chicken eggs on the basis of smooth surface texture and colour. The third group was attributed to Mute Swan on the basis of the shell thickness and size of the fragments. The fourth group was assigned to a wader, probably Lapwing (*Vanellus vanellus*), on the basis of thickness and colour pattern.

#### 4.1. Description of the samples

The eggshell samples are presented in chronological order in table 1 with the following information: sample number, sample context, archaeological code, level number, date, and weight of the eggshell fragments (including the remnants of the membranes) attributed to that species. The code after the sample number, for instance 255, relates to the archaeological feature. Where more than one sample has the same number, the samples are derived from different levels in the same feature.

Table 1.

Sample No.	Origin	Arch. code	Level	Date	
1	Refuse pit	255	7	13th cent.	11.1 gr chicken
2	Tanning pit	323	9	13th cent.	3.2 gr duck, more membrane than shell
3	Tanning pit	315a	9	13th cent.	1.3 gr chicken
4	Tanning pit	315b	9	13th cent.	4.5 gr chicken
5	Refuse pit	325	9	13th cent.	4.8 gr duck, 3.8 gr chicken
6	Refuse pit	325	11	13th cent.	3.8 gr chicken
7	Cesspit	312	10	14–17th cent.	5.1 gr chicken
8	Cesspit	312	9	14–17th cent.	6.0 gr chicken
9	Cesspit	393	10	15th cent.	10.5 gr duck, 0.5 gr Lapwing*
10	Well	178a	7	15–17th cent.	36.0 gr duck, 11.5 gr chicken
11	Well	178b	7	15–17th cent.	10.0 gr duck, 11.1 gr chicken**
12	Well	178c	8	15th cent. and later, especially 17th cent.	16.5 gr duck, 4.0 gr chicken
13	Refuse pit	206	6	16th cent.	36.9 gr swan
14	Refuse pit	198	7	16/17th cent.	7.3 gr chicken
15	Refuse pit	198a	8	16/17th cent.	4.0 gr chicken, 2.4 gr duck, 1.0 gr Lapwing
16	Refuse pit	198b	8	16/17th cent.	7.8 gr duck

\* Sample sieved.

\*\* Remaining 43.8 gr, white and brown, pushed in two clusters: series 1 = 4 eggs, series 2 = 5 eggs.

#### 4.2. Analysis of the samples

In order to check whether the identifications made with the naked eye were correct, detailed pictures of modern reference material were made and compared with pictures of the subfossil eggs. In figure 2 the outer surface of the egg of a call duck is shown at 81x magnification, using skimming light. The surface is smooth in duck eggs, giving a gleaming appearance. Tiny impurities are present in the shell. Figure 3 represents a piece of shell from Sneek sample number 10 (178a), identified as duck. Under magnification it resembles the reference shown in figure 2, a piece of duck egg including impurities. It should be pointed out that several duck species lay this type of green egg. In Sneek, feral or wild duck is considered the most likely kind but a species such as shoveler (*Anas clypeata*) cannot be ruled out.

The largest group, that of chickens (fig. 4), is represented by modern reference material from the local breed, the *Fryske hinne*. The photograph is taken exactly the same way as in figures 2 and 3. The small depressions that show up as black holes are characteristic. Figure 5 shows the matching subfossil shell from sample number 10 that can be identified as chicken. The history of the chicken dates back to early times. In a small homestead at the edge of Sneek and dating back to the early Roman period Ufkes found an egg of baked clay, clearly the size and shape of a chicken egg and a model of a rooster (Ufkes, in prep.).

The bright brown colour of some chicken eggshells that often covered part of the shell posed a problem. Magnification of 81x showed that the brown colour precipitated as rusty coating on the shell (fig. 6), very different from the brown colour of a modern egg. Brown eggs are unlikely before the 18th century as is explained elsewhere in this paper.

Eggshells in Sneek from the 13–17th century are predominantly (75%) chicken, whereas those of ducks came second and are present in 50% of the samples.

The third category is represented by a specimen attributed to the mute swan and identified by its shell thickness (Keepax, 1981). The colour confirms this identification and the total weight of the fragments of 36.9 gr is about the same as the average weight given by Hellebrekers (1950) as 38.8 gr. This find is unexpected because it is not easily explained as normal daily consumption. It appears that the swan egg was opened with a knife. This is not shown by the shell pieces, which are not big enough to have a cut edge but is shown by the top part of the inner membrane, which has been detached along a rather straight edge. The form of this part could also suggest that the egg had hatched. No signs of veins were found, however, on the inside. The surface structure

(fig. 7) is typical for swan eggs showing interrupted coating.

Sample 13 contains eggshell fragments with a light green colour and calcareous blotches visible to the naked eye. The egg has been broken into pieces of which the largest measure about 5 cm<sup>2</sup>. The shell has a thickness varying from 0.63 mm to 0.78 mm (fig. 1) and, therefore, clearly indicates a swan egg. The weight of 36.94 gr compares well with the average of 38.81 gr ( $N=25$ ) given by Makatsch (1976). The inner membranes were to a large extent preserved apart from the shell that fell off in pieces.

The presence of the egg of a Mute Swan is not altogether unexpected because swans were kept in many parts of northwestern Europe and were kept also in Fryslân. It is not likely that wild mute swans occurred in Fryslân, even in the 16th century (Van der Ploeg et al., 1976). In 1529 rights for the keeping of swans by inhabitants of several towns were described in the 'swanbook', which also registered the official owner's marks on web and bill. The swan necks, which traditionally decorate both outer ends of the barn of the farm, were originally the sign of a free man.

The fourth category consisted of tiny fragments (c. 3 mm in diameter) of a thin shell (fig. 1) with an olive colour and black and dark brown blotches. Cultural information from Fryslân suggests the presence of Lapwing eggs but another wader, the Redshank (*Tringa totanus*), is also possible. A picture of a modern Lapwing egg shows the typical round knobs in the enlarged structure of the outer shell (fig. 8). The picture of the subfossil shell (fig. 9) matches that of the Lapwing. A modern Redshank egg can be distinguished from a Lapwing egg by its colour, which always has a hint of red in the light-ochre/olive. The blotches are also more reddish in the black and brown than the blotches of the Lapwing. Redshank blotches are generally smaller than those on Lapwing eggs. In the tiny subfossil pieces neither the colour nor the size of blotches were sufficiently distinctive and the microstructure had to be studied. Figure 10 demonstrates the characteristics of the shell surface of the Redshank egg. The Lapwing eggshell has typical small conical knobs on the surface where the Redshank displays bigger elements that are not as prominent and are flatter. These characteristics enable us to identify the Wader eggshells from Sneek to the Lapwing. Their date is 15th–17th century, a date that is in accordance with documentary sources (Brouwer, 1954).

Even today the eggs of the Lapwing (*Vanellus vanellus*) are collected and information on the laws and regulations dealing with the gathering of eggs of waders in Fryslân goes back at least to January 1542 (Merula, 1605).

## 5. RESULTS AND CONCLUSIONS

Table 1 shows that eggshell weight varies from 1.34 gr (sample No. 315a) to 70 gr (in sample 178b). When present, the leathery membranes cause a slight overweight because dirt particles often stick to them. When the average weight of modern eggshells of chicken or duck is used as a reference, many samples contain the remains of several eggs. The samples 5, 9, 10, 11, 12, 14 and 15 must represent a minimum of c. 5–12 eggshells.

The medieval chicken breed from Sneek was probably related to or identical with the *Fryske hinne*. This chicken belongs to the group of the breeds from the Netherlands, which includes the *Drents hoen*, the *Groninger meeuw*, the *Assendelfter*, the *Hollands hoen* and the Belgian *Braekel*. These chicken breeds were part of a large group that occurred in the area from northern France to the north-west-German lowland up to the 20th century. They are elegant, slender, medium-sized breeds, a moderate laying type with a peak egg production in spring and summer, and are not inclined to become broody. The modern Frisian chicken is of the same size and shape as those found in the *terpen*, the dwelling mounds dating from between about 400 BC and AD 900 (Oosterhaven, 1992). At the end of the 19th century and at the beginning of the 20th century, the Frisian breed, rarely found on farmyards, displayed the following colour patterns: *wytweiten*, *gielweiten*, *gielwytweiten*, *reaweiten*, and *reabûnt*. In these Frisian breed names, the first part stands for the colour, white, yellow, yellow-white, and red respectively. The second word explains the pattern, with *weiten* best translated as barred and *bûnt* as spotted. It is noticeable that the basic wild-type colour pattern 'partridge', so common in many old-fashioned breeds, is not present in the late 19th and early 20th century Frisian chicken.

The eggs of the old rural breeds were small and white. At the beginning of the 20th century these breeds were replaced by more prolific layers, for instance the Leghorn or more fleshy breeds such as the Wyandotte. Brown eggs appear at the end of the 19th century, apparently produced by crosses of local breeds with imported East-Asian breeds such as the Cochin, Brahma, Langshan and Maran (Banning-Vogelpoel, 1972). These crosses led to breeds such as the Barnevelder and the Welsummer at the beginning of the 20th century. In the samples from Sneek brown eggshells appear before the 18th century suggesting a much older date. It is therefore of importance to establish whether the brown eggs found in the excavation at Sneek were really brown eggs or whether the eggshells have been stained by the refuse in which they were buried. In Section 4.2 it is stated that some of the eggs from Sneek show a bright brown colour which is artificial and it can be con-

cluded that the influence of East Asia had not yet reached this part of Fryslân. Nevertheless, the early chicken eggs from Sneek do not seem to have been white but very light buff, a colour often found in farmyard chickens of nondescript ancestry.

What kind of duck eggs were eaten in Sneek? The origin of duck keeping in Fryslân has its roots in the past. In Frisian villages and small towns where plenty of water occurred, free range 'village ducks' were kept by special societies (Van der Meulen, 1976). Members paid a subscription and the cost of the nest boxes placed on the water. With this money the ducks are fed during the winter. In 1937, the town of Akkrum had 2000 'village ducks', nondescript birds, often somewhat bigger than a Mallard. They were sometimes piebald, an advantage because gunmen hunting could see that they belonged to the village. These ducks supplied the villagers with eggs which were also used by the bakers, including 'beschuit' bakers. The duck eggs that were excavated may have been laid by free range 'village' ducks, which are plentiful even today in the town of Sneek. Duck eggs could also have been gathered in the wild. This last option may be less likely because taking such eggs was officially forbidden because of the shooting rights known to have existed from the 15th century and later (Merula, 1605). However, such rights may have been less rigid in Fryslân than in other parts of the Netherlands because very liberal ideas on the legal ownership of natural products and trespassing in the province of Fryslân still exist to the present day. Eggs that were taken illegally would have been consumed on the farms or in the smaller villages. The duck eggs of that time would have been of the green variety and the light creamy eggs of the more recent, productive breeds such as Caki Campbell developed much later.

### 5.1. Archaeological implications

The amount of eggshell found in the backyard seems to depend upon the conditions under which it was discarded. Why not more eggshell remains were found in the excavated area remains to be answered, because the people must have eaten far more eggs in the course of five centuries.

Based on the results of the excavation, four categories of deposition were made: tanning pit, large rectangular refuse pit, cesspit and well. Both the tanning pits and the refuse pits may have been open. The quantity of eggshell from these features is small and suggests that the shells were stolen from the refuse by animals and disappeared in this way. The cesspit samples also contain low to medium numbers of eggshell, which may indicate that they were not normally used for dumping kitchen refuse. While eggshells in urban areas usually end up in the dis-

posal bin, in rural areas empty eggshells are pushed into each other and then dried. The drying is essential because the shells cannot be crushed while the inner membranes are still soft and holding the shell together. Eating half shells would not be much of a problem for chickens but is to be avoided because the birds may learn to eat their own new-laid fresh eggs. Where chickens were kept freely in the yard they would have eaten eggshells that were thrown out. As chickens or scavengers had no access to the dangerous cesspits, eggshells in such contexts were relatively safe.

The remains of the complete eggshell of a swan were found in a 16th century cesspit. The swan egg seems to have been opened in the way a cooked egg is opened for consumption. This was not concluded from the shell fragments, which measured at most 5 cm in diameter, but from the shape of the piece of leathery inner membrane. This piece is cap-shaped with a somewhat straight edge, suggesting that it was cut off with a knife.

The fourth category is the well. In principle a well is not used to dump refuse but when the well is no longer used for clean water, the hole is subsequently filled in with all kinds of debris. As with the cesspit, eggshells dumped in the well are safe from animals. This explains why the eggshells are found in large clusters.

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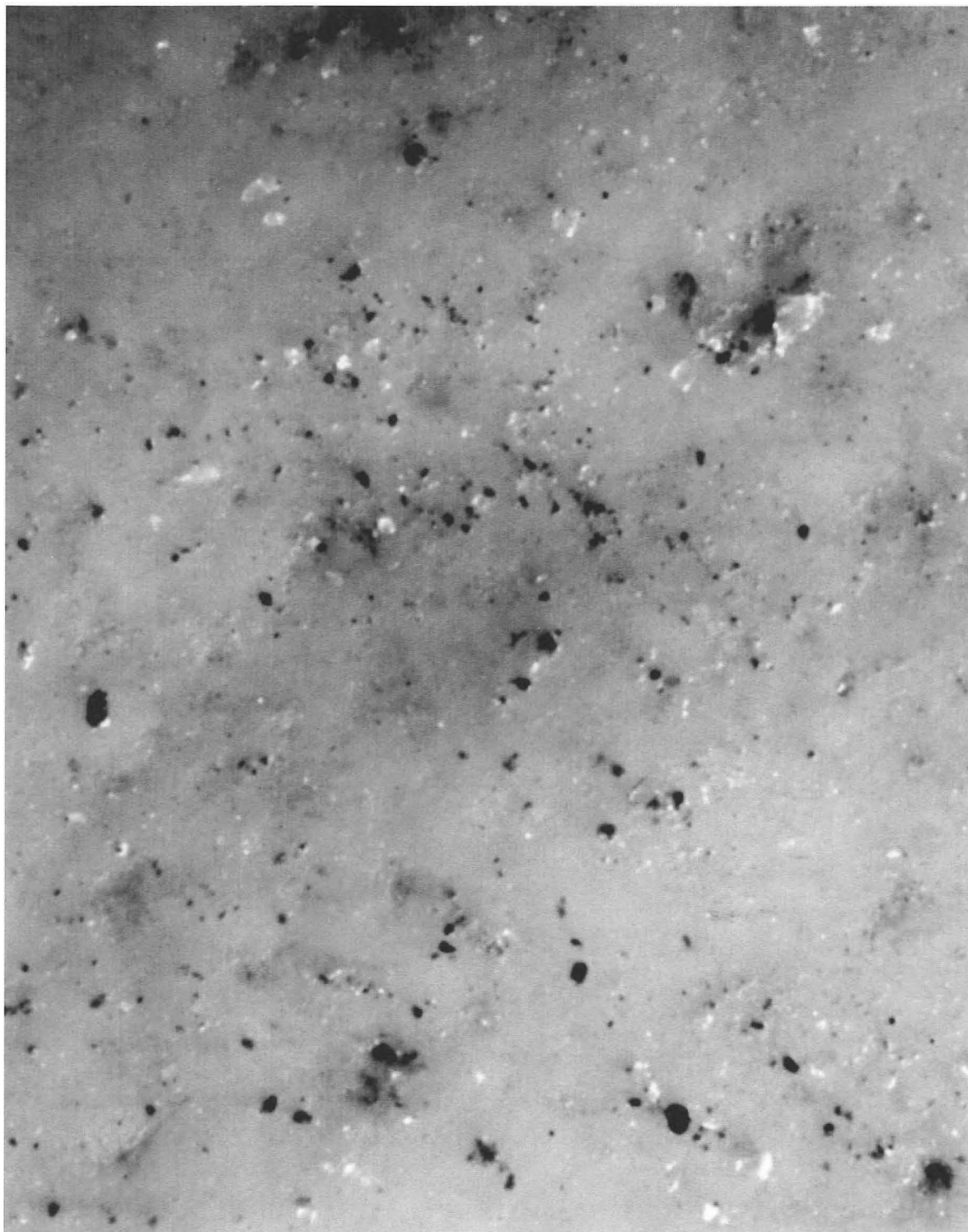


Fig. 2. Outer surface of the modern eggshell of a call-duck magnified 81 times. The piece of shell is 2.2 mm wide.

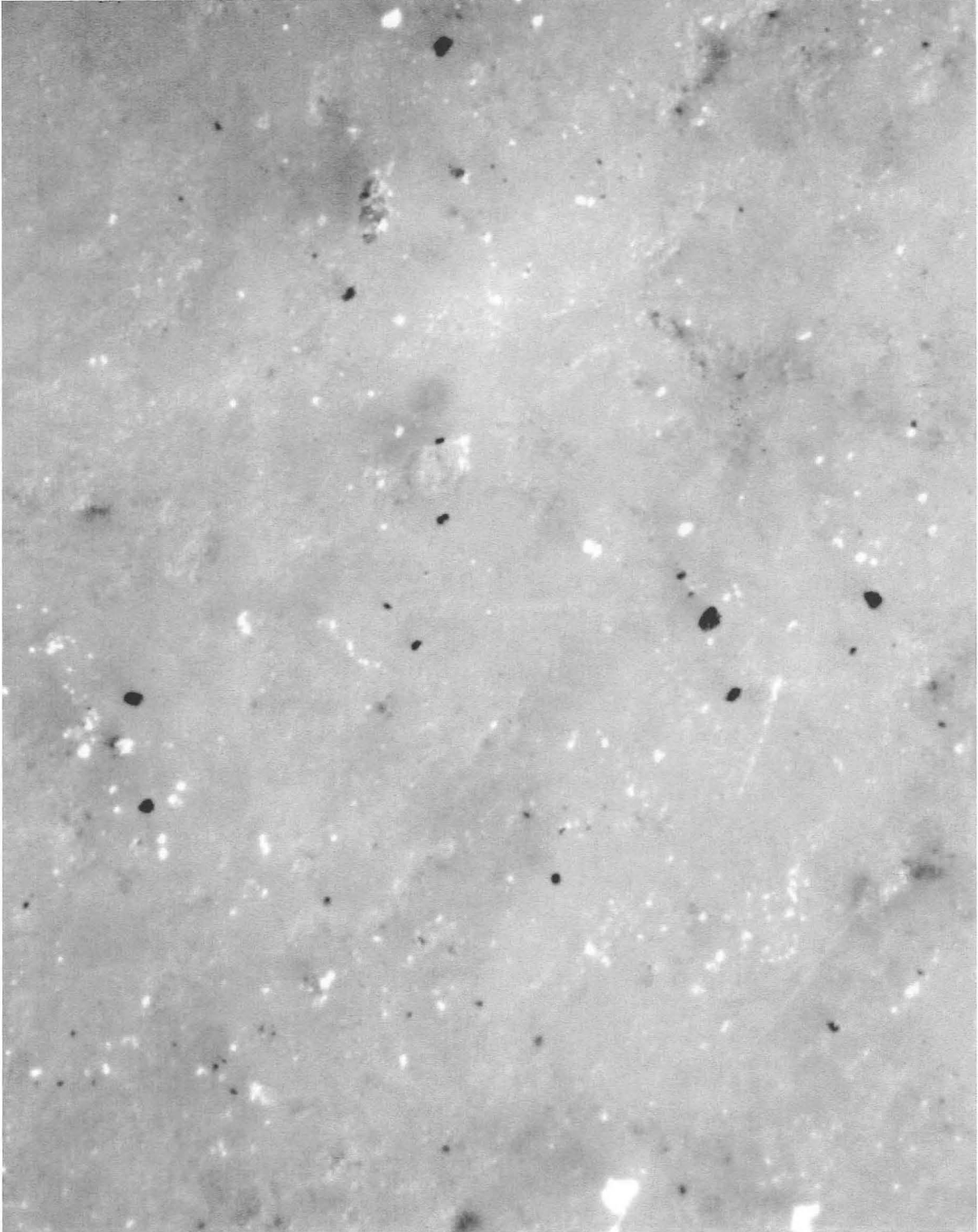


Fig. 3. Outer surface of subfossil eggshell ascribed to duck from sample Sneek 178a (15th–17th century). Magnification 81 times.

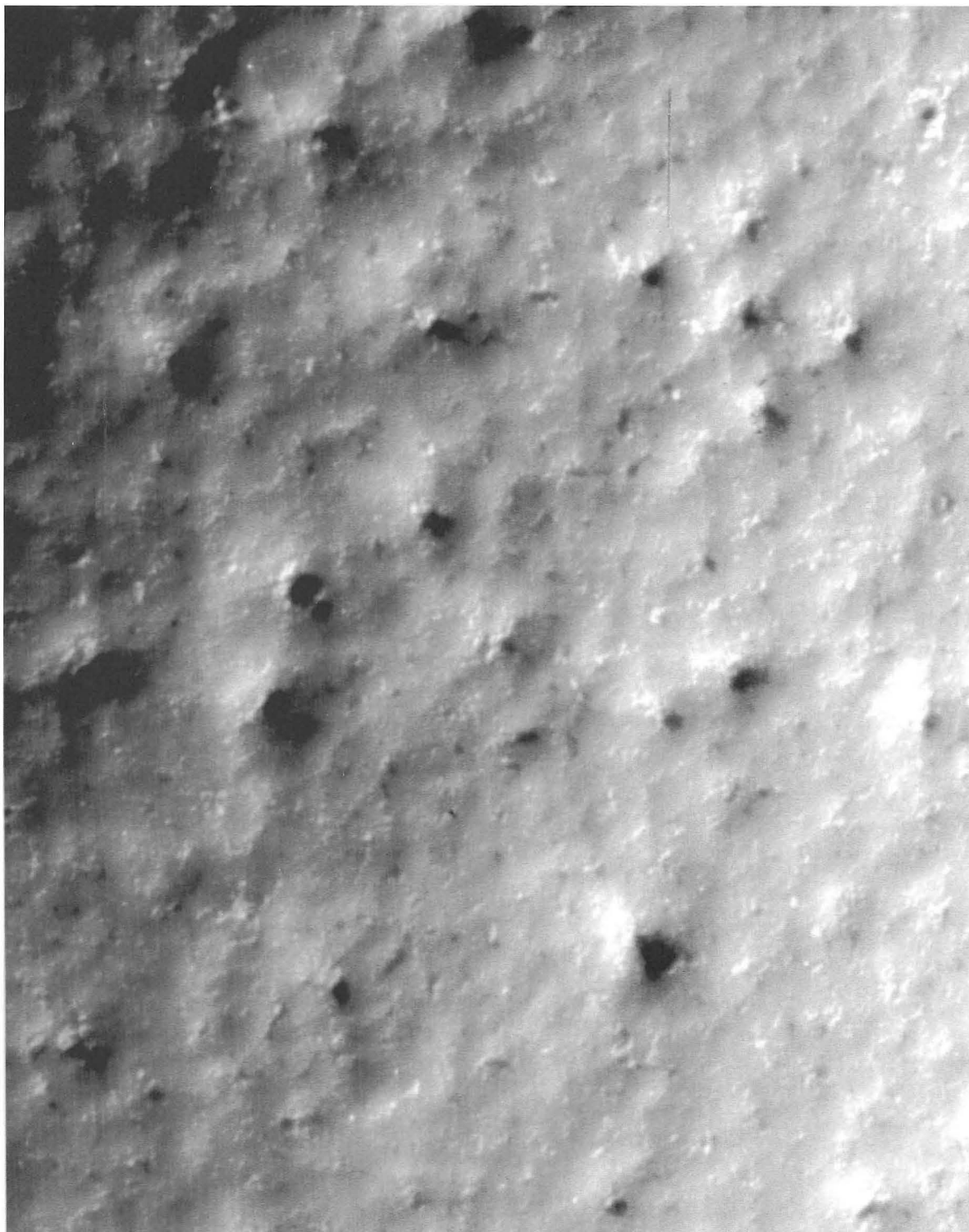


Fig. 4. Outer surface of modern eggshell of the old Frisian chicken breed (*Fryske himme*). Magnification 81 times.



Fig. 5. Outer surface of subfossil eggshell ascribed to chicken from sample Sneek 178a (15th–17th century). Magnification 81 times.



Fig. 6. Outer surface of subfossil rust-stained eggshell ascribed to chicken from sample Sneek 178b (15th–17th century). Magnification 81 times.





Fig. 7. Outer surface of subfossil eggshell ascribed to Mute Swan from sample Sneek 206 (16th century). Magnification 81 times.

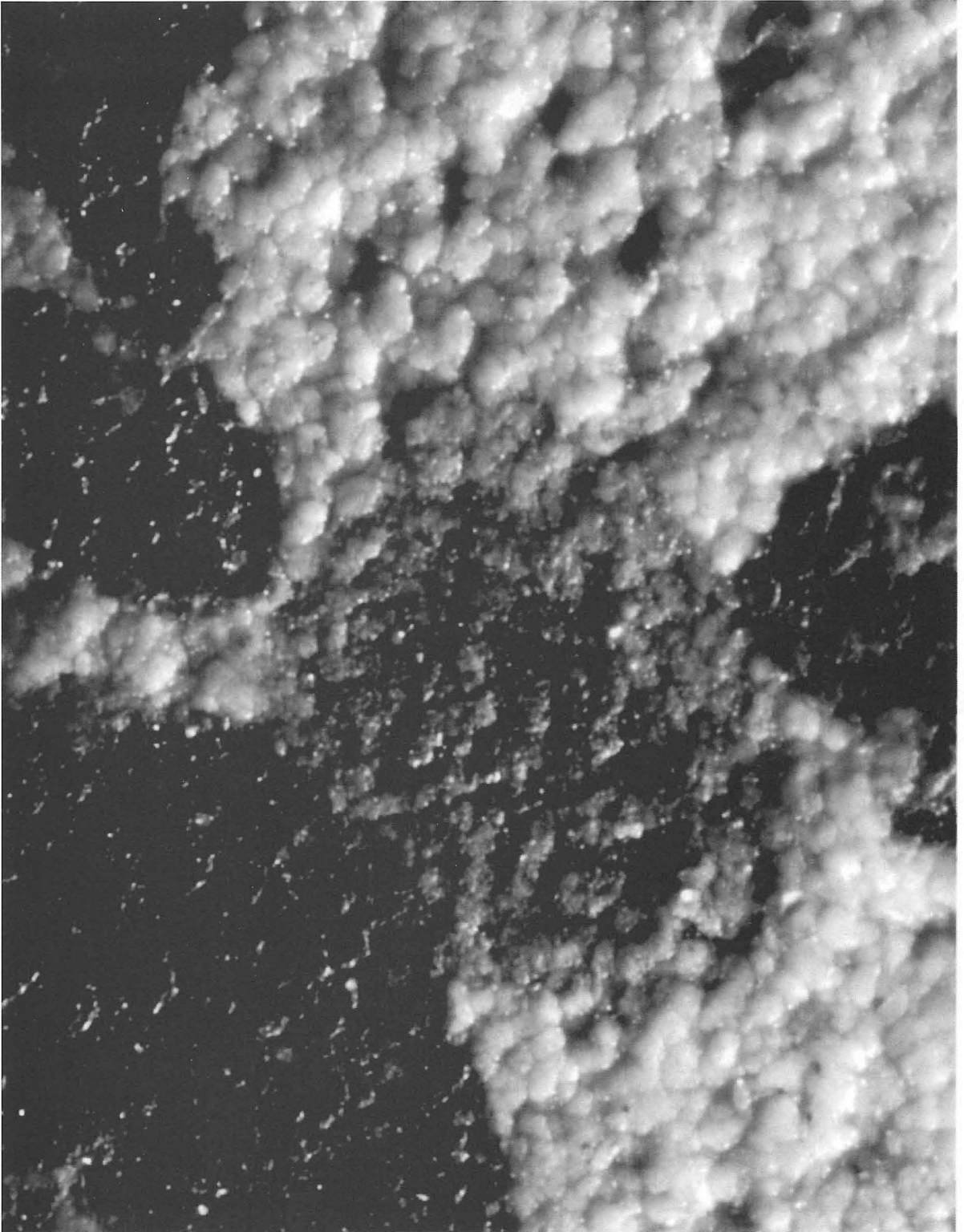


Fig. 8. Outer surface of modern Lapwing eggshell. Magnification 81 times.



Fig. 9. Outer surface of subfossil eggshell ascribed to *Lapwing* from sample Sneek 393 (15th century). Magnification 81 times.



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Fig. 10. Outer surface of modern Redshank eggshell. Magnification 81 times.