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The dynamic of the Iron-age village

A technique for the relative-chronological analysis of area-excavated Iron-age settlements

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This article presents a technique for the analysis of relative-chronological relationships within area-excavated Iron-age settlements. A system of relational descriptions is built up, which demonstrates the feasibility of inferring relative-chronological relationships between features from a variety of observations made during excavation, and translating these into formal logical expressions. The logical expressions make it possible to construct a detailed diagram of the temporal structure of the settlement under investigation. The application of this method is illustrated in relation to a small segment of the 3rd- to 7th-century settlement at Nørre Snede, Mid-Jutland. Finally the potential of this technique for analyses of the temporal structure of settlements is discussed.

INTRODUCTION

The use of machines to strip the sites of Iron-age settlements with no surviving culture layers was a methodological revolution when first introduced around 1960, and one which yielded a body of data of hitherto unseen character. The exposure of very large areas and a sharp focus on the constructional entities of the settlements made it possible to achieve a comprehensive image of the settlements and to follow their development over periods of several centuries.

In connection with the very extensive area excavations in Jutland in the 70's and 80's, settlement mobility became very much a central research topic, primarily as a result of the studies at Vorbasse (Hvass 1979; 1983a). At a micro-level a continuous change in the appearance of the individual farmstead could be observed, but even more revolutionary was the indication of clear structures in the course of development even at the general village level. These observations gave the Vorbasse excavations a very prominent role in the characterisation of the "shifting village", a term which C. J. Becker had introduced in connection with the investigations at Grøntoft (1972).

The image that an area excavation presents us with initially, however, is static. It is very much like a photograph taken with an extremely long exposure time, and the job of reconstructing the dynamic original development is a large and complex one. A huge quantity of observations has to be transformed, by various processes, into a body of data, which can be processed using logical principles, and subsequently used to build a model of the development of the village. The purpose of this article is on the one hand to present some theoretical considerations relating to the dynamic of area-excavated Iron-age villages, and on the other to develop a technique based upon these points. This technique results in a detailed relative-chronological sorting of the entities of the settlement and will be capable of contributing to our understanding of the character of the mobility of the Iron-age village. It is primarily applicable to settlements at which the quantity of relationships between the different entities of the site is large, which in practical terms means settlements with preserved fence-lines. A limited segment of the Mid-Jutlandic settlement at Nørre Snede of the later Iron Age will be used to demonstrate this, and the informative potential of the method will be discussed to conclude with.

THE CHARACTER OF THE DATA

Both the method of excavation and the post-excavation analyses of area-excavated Iron-age settlements lacking preserved culture layers are directed first and foremost at exploiting the information potential of the structural traces. In the absence of find-bearing cultural layers the artefactual evidence is often limited in range, highly fragmentary, and rarely representative, all of which seriously reduces the scope for analysis based upon the finds. This tendency is particularly marked on late Iron-age sites, a period in which the pottery both reduces in quantity and loses formal and ornamental characteristics, significantly reducing the information potential of the excavated artefactual finds. As a result there are still major problems for the establishment of a ceramic chronology that can be employed with the settlement finds of the later Iron Age, putting limits to the level of detail in which the temporal development of the settlements can be illuminated by the finds. On the other hand, the best preserved settlements are characterised by a very large and often only partially exploited body of relative-chronological evidence in the form of a substantial body of documented observations of the structures' relationships with one another. The constant movement of the entities of the settlement means that the structural traces intercut extensively, that openings in fences and doorways are blocked by earlier or later features, buildings and fence-lines are joined together, and so on.

The sheer quantity of data, however, renders it very necessary for the analyses to be conducted with a consistent and explicit method (Madsen 1995). This consistency is an essential prerequisite for the use of digital data processing, without which it is in practical terms impossible to comprehend the basic data and thus to exploit its information potential to the full. We end up reducing the level of detail and merging a series of complex temporal observations to some general and simplified term. The most important reason to develop a formal technique of relative-chronological analysis, however, is that the temporal sorting of a village excavation is, like any other analysis of archaeological evidence, a process of interpretation, the end result of which is based upon a wide range of preconditions. By formalising the methodology and formulating it explicitly one can ensure that these preconditions are absolutely clear. In this way it is possible to measure both any uncertainties that reside within the results obtained and the degree to which the latter can be used in further analyses while avoiding circular arguments. The development of the method itself thus comprises a far from insignificant element of epistemology.

An Iron-age settlement can be treated as a form of system of relations. There is a set of basic entities: the buildings and fences, which are linked together in relative-chronological relationships on the evidence of, for instance, the cutting of one feature by another. The intercutting structural traces of area excavations can thus be equated to the sequences of layers in stratigraphical excavations, where we have already worked for a long time with a stringent, graph based sorting system, the so-called Harris matrix (Harris 1975; 1989, 120ff). In this, each stratigraphical event constitutes an element, whose temporal relationship to another element can be described in terms of one, and only one, of three possible relationships: "earlier than", "later than" or "contemporary with". Portraying the individual entities as boxes that are connected by lines graphically represents this: horizontal for contemporaneity and vertical for earlier-/later-than relationships. There are now several computer programmes available that can produce such graphs (e.g. Herzog 1993). The Harris matrix method was developed in 1973 and has since then occupied an important place in the continuing discussion of the archaeological treatment of stratigraphy (Harris *et al* 1993). To develop a method for the relative-chronological sorting of Iron-age settlements, it is appropriate, therefore, to start from the debate over stratigraphical analysis.

THE SORTING METHOD

The starting point for any work on patterns within Iron-age settlements is, as already determined, the individual structures: buildings and fences. Since the identification of these entities is of such fundamental importance, it ought for the most part to be carried out even while the excavation is still in progress, where, self-evidently, we have the optimal opportunity to test hypotheses (Hvass 1983b). The farmsteads of the village are, consequently, divided into a wide range of entities: longhouses, minor houses, fence-lines, granaries, etc. All of these entities are included in the temporal sequence and are normally regarded as each constituting a temporal unit, with a clear-cut starting date and end date. A particular line of fencing is assumed to have been constructed, in practical terms, at a particular moment and likewise physically ceased to exist at another precise moment. The same, in general terms, holds for the farmstead as a whole. The earliest features are assumed to have been created to all intents and purposes at the same time, and when the farmstead ceases to exist it is the whole complex, fences and buildings, that disappears together. The situation is quite different with farmstead phases, which are dynamic combinations of entities that do not necessarily share a common start and end point.

The unambigous start and end dates are, self-evidently, both approximations and assumptions. In purely physical terms it is clear that the "moments" must have had some extent of their own, although in the relative-chronological sorting of the Iron-age settlements the duration of at least the period of construction is taken to be so slight that it can simply be ignored. The end date is somewhat more problematic. It is well known that the abandonment of a structure can be a drawn-out process. The cessation of use of a building for occupation is not the same as the end of its physical existence. It may collapse slowly and be part of the landscape in one form or another after abandonment (Cameron 1991). It must therefore be emphasised here that what we use in the relative-chronological sorting is observations of traces of the physical features and not of their function. The start date for a structure is consequently the point at which it appeared in physical terms. Similarly the end date is the point by which an element, in physical terms, must have disappeared or been so reduced that it no longer had any physical influence on new entities. Even though the concept of end date is most appropriate in respect of the deliberate demolition of structures, there is in principle no objection to using the end date as an abstract, purely functional concept, relating to the gradual decay of buildings.

On the basis of the above, we can treat it as an acceptable generalisation, that Iron-age settlements consist of a series of entities: fence-lines, buildings and, somewhat less certainly, farmsteads, all of which are characterised by unambigous start and end dates.

Starting from the Harris matrix model, the relative-chronological sorting can be understood as a representation of the temporal relationships between the entities of the village distinguished. Here it is of the greatest importance that the entities are temporal unities. If this is not the case, logical inconsistencies will emerge sooner or later, which will prevent the systematic treatment of the evidence that is absolutely essential with the huge quantities of data from area-excavated settlements.

It is not, however, possible simply to use the same principles of description that can be used in stratigraphical excavations. In the later the individual entities function as if they were *moments in time*, while with the often very large number of more or less contemporary entities from Iron-age villages it is of great importance to be able to work with the fact that the structures cover a *span of time.*

If one understands a span of time as the period between a start date and an end date, it is possible to describe the life-span of the entities by using two moments in time, with the start date and the end date being linked in an earlier-/later-than relationship. It is then possible to describe every element's temporal relationship to any other element in terms of the relationships between the two entities' start and end dates. These points, to which the relationships refer, are called *relata.* One can thus distinguish on the one hand between an expression such as "X is earlier than and of a different period than Y" (end of X is earlier than start of Y), and "X is earlier than and immediately succeeded by Y" (end of X is contemporary with start of Y) on the other. At the same time it will be possible to describe a situation in which a fence is built on to an earlier fence and both fences are decommissioned at the same time (start of X is earlier than start of Y and end of X is contemporary with end of Y). In a formal description of these expressions, "earlier than" is represented by the symbol \ and "later than" by /, while contemporaneity is represented by =.

It must be noted, that in principle the start and end dates which define the entities' life-span cannot be counted in the life-span, as that would imply that two successive entities existed together at the point at which one element comes to an end and the other begins. Even though this is insignificant in terms of the archaeological problem, it is in logical terms important to understand that the life-span of the entities includes only the open interval between the start and end dates.

It is only a very small proportion of the originally colossal volume of relationships that can now be inferred from the archaeological evidence, and so with the majority of the entities it is not possible to detect the exact temporal relationships between the start and end dates of the entities. All the same we may have observations that indicate or demonstrate that two such "floating" entities either cannot both have existed at the same time or conversely that they must have co-existed in at least some of their respective life-spans. In logical terms it is still possible to describe the temporal relationship between the two entities by relating their start and end points alone in terms of the relations "earlier than", "later than" and "contemporary with", but it is necessary to link these relationships with logical operators, i.e. "and", "or" and "either/or" expressions for which AND, OR and XOR is used. The expressions "younger than or contemporary with" and "earlier than or contemporary with" can be abbreviated to $/=$ and $\backslash=$.

The temporal relationship between two entities about which we know only that they existed concurrently at some time can thus be described as *start of element X is earlier than end of element Y and end of element X is later than start of element Y*, or, more formally:

$$\text{X(start)} \backslash \text{Y(end) AND X(end)} / \text{Y(start)} \qquad (1)$$

Similarly, the temporal relationship between two entities which definitely did not exist at the same time can be described as *either start of element X is later than or equal to end of element Y or end of element X is earlier than or equal to start of element Y*, which appears formally as:

$$\text{X(start)} /= \text{Y(end) XOR X(end)} \backslash= \text{Y(start)} \qquad (2)$$

The use of the AND expression is unproblematic as it only means that an observation involves two or more relationships between the relata of the compared entities. On the other hand OR and XOR expressions are problematic in respect of the production of a graph showing the temporal relationship between entities as it is not possible to represent this uncertainty. The problem can partly be solved by including the new relationships $\backslash=$ and $/=$, but a series of other expressions are impossible to represent without one element appearing in several places in the graph, an undesirable situation for several reasons. It has therefore been necessary to accept that we can have observations from an excavation which imply relationships that can influence how the individual entities are placed in the relative-chronological sorting but which are not represented in the graph based presentation of this scheme.

In order to achieve optimal exploitation of the potential information from major area-excavated Iron-age settlements and a precise description of the temporal relationship between the entities of the village, it is thus necessary to establish a far more complex descriptive system than that which has traditionally been used for the relative-chronological sorting of stratified excavations. If one sticks to the simple method of description one at best gets a simplified image. Large groups of entities will appear to have been demolished or constructed at the same time, even though in reality they represent gradual replacement. The account thus loses some of the dynamic that the evidence embodies. Finally it will be more difficult to measure the weaknesses in the sequence of development one produces as, for example, a relationship of contemporaneity will lock two entities together in respect of both their start and end dates, while the entities with the extensions presented above are only aligned just as much as there is evidence for in the observations made in the course of excavation.

It needs finally to be noted that the principles presented above can not only be used in connection with area excavations of Iron-age sites but also for the temporal sorting of any group of entities with a diachronic dimension that are linked together by relative dating.

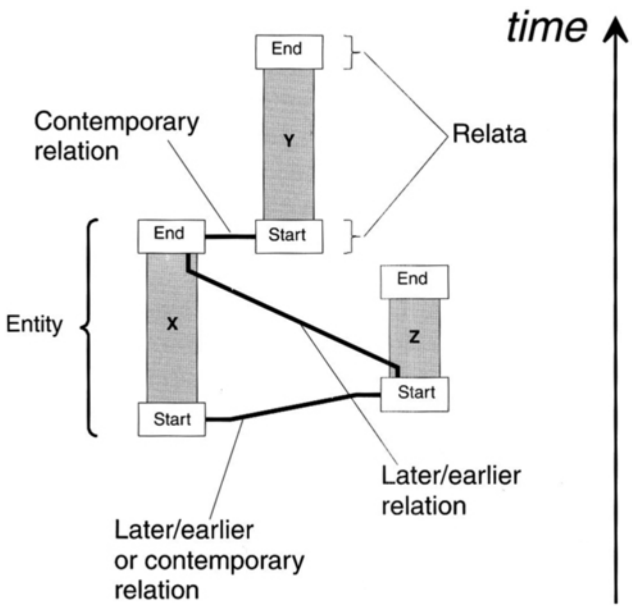

Fig. 1. The main components and terminology of the graphical representation of the relative chronological sorting.

THE PRODUCTION OF THE RELATIONSHIPS

From the above survey we can distinguish three levels in the process of relative-chronological sorting:

1) A level of observation, in which the significant relative-chronological facts from the excavation are recorded. At this level one works with *entities*: in other words the unambiguously temporally discrete structures such as buildings and fences.
2) A level of logical operation, in which the observations are reformulated in terms of formal relationship expressions which are collated and reduced to the shortest possible logical terms. At this level each element is represented in terms of two *relata*: the start and end point of the entity. Relata are connected by *relationships* and the sum of the relationships between two entities is the same as the *relative-chronological relationship* between the entities in question.
3) Finally, a level of graphic modelling, in which a graph of the relative-chronological sorting is produced on the basis of the inferred relationships (Fig. 1).

The following section focuses on how we move from the one level to the next; in other words on how the various observations from the excavation are translated into relationships, and how the relationships can be used to construct a graphic image of the relative-chronological relationship between the entities of the settlement.

It is rare for the field records relating to the temporal position of the structures to be immediately interpretable in terms of relationships between the start and end dates of the entities. It will often, in fact, be necessary first to clarify what degree of continuity there is in the replacement of structures, and the earliest and latest phases of the farmsteads have to be identified, before it is possible to deduce the precise relative-chronological relationships between the two entities: i.e. a number of observations have to be linked together. In a typical excavation situation where only a limited part of the settlement area is open at any time it is often very difficult to get a clear view of all of these observations in the field, and a direct relative-chronological sorting of the entities of the settlement is consequently only rarely possible. Finally a range of information about the temporal relationship between entities is not deliberately collected but can be discovered later by examining the composite excavation plans and with the help of parallels from other area-excavated Iron-age settlements. The basic evidence for the relative-chronological sorting of the Iron Age settlement thus takes the form of a range of more or less deliberate, formulated or unformulated observations, about the temporal relationship between the entities.

It must be emphasised that the production of relative-chronological observations involves a great deal of interpretation, and is based on a number of principles and presuppositions, which can rarely be explicitly formulated. During the area excavations with many overlapping construction traces the model is based primarily on an assumption, well-supported by the more thinly spread settlement, that the settlement consists of a number of well-defined, autonomous farm units, the central structure in which is the longhouse. An absolute rule is that a farmstead at any one time comprises one and only one longhouse. Something similar is assumed to be the case for the fences, which delimit the farmstead area: we do not have several contemporary parallel rows of fencing bounding the farmyard. These assumed principles of architectonic composition are highly influential in directing the inference of relative-chronologically significant observations, and the temporal importance we attribute to a variety of our excavation records presupposes that the principles enunciated here are valid for the lifetime of the structures.

The observations relevant for relative chronology can be sorted into five groups: asynchronic, synchronic, diachronic, implicitly continuous, and implicitly discontinuous observations. We can also talk about two types of observations: on the one hand those that are simple and direct, and on the other those that are complex and derivative.

The asynchronic evidence is characterised by yielding information about what cannot have been contemporary, while the synchronic observations, by contrast, demonstrate contemporaneity. The diachronic observations provide information about the temporal sequence of features in the settlement. The implicitly continuous evidence indicates which entities can be regarded as being linked in a temporally coherent sequence while the implicitly discontinuous observations conversely separate phenomena in time.

This classification of the evidence or indications from the excavation concerning the temporal relationships between structures naturally constitutes a systematisation and clarification of the large number of observations made during area excavations. But by far the most important reason for this systemisation is that these five groups have different implications for the deduction of relationships between relata.

The difference between the simple, direct observations and the complex, derived observations covers the fact that certain relative-chronological relationships can be drawn directly from one simple field observation, while others require a wide range of single observations to be put together. The latter, complex observations can be difficult to deal with systematically, and to allow for checking of the relative-chronological sorting it is important that an account is given of the character of the complex, derived observations every time they are used.

There is one final distinction amongst the observations that should briefly be introduced. This concerns the difference between what we can call symmetrical and asymmetrical observations. With symmetrical observations the temporal expressions will be the same, irrespective of which entity one takes as the base line, while the temporal expressions with the asymmetrical observations will vary according to the reference point. For instance, an observation, which states that two entities were in existence at the same time, is a symmetrical observation, while one that states that one element is earlier than another is asymmetrical.

It is important to stress that the difference between the symmetrical and the asymmetrical here refers to the structures' temporal position at the level of observation and not to the relationships at the logical-operative level. We can indeed talk about symmetry and asymmetry at the logical-operative level. Thus = is a symmetrical relationship, while / and \ are asymmetrical and the inverse of one another. At the logical-operative level, however, the difference between the symmetrical and the asymmetrical refers to relata, while that at the observational level refers to the entities or structures. As a result, an observation can be asymmetrical while its relational expression is symmetrical. For instance, an observation that shows that one element succeeds another will be asymmetrical at the observational level. If the earlier feature be X, the relationship will be:

$$X(\text{end}) = Y(\text{start}) \tag{3}$$

while the expression of the inverse situation in observational terms, with X now the later feature, will be:

$$X(\text{start}) = Y(\text{end}) \tag{4}$$

At the logical-operative level these are two symmetrical relationships, each with its own relata.

The logical asymmetry is important in the context of recording in a database, where both the relationship and the inverse relationship have to be registered. This is, however, of less importance in connection with the translation of observations into formal logical relationships, which is the subject of the following sections.

Asynchronic observations

Asynchronic information (Figs. 2-3) indicates which phenomena cannot have been contemporary, with-

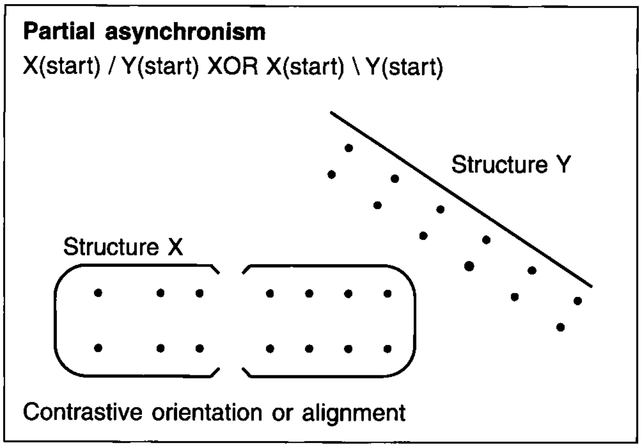

Fig. 2. Partial asynchronism. Example of observation and the logical expression.

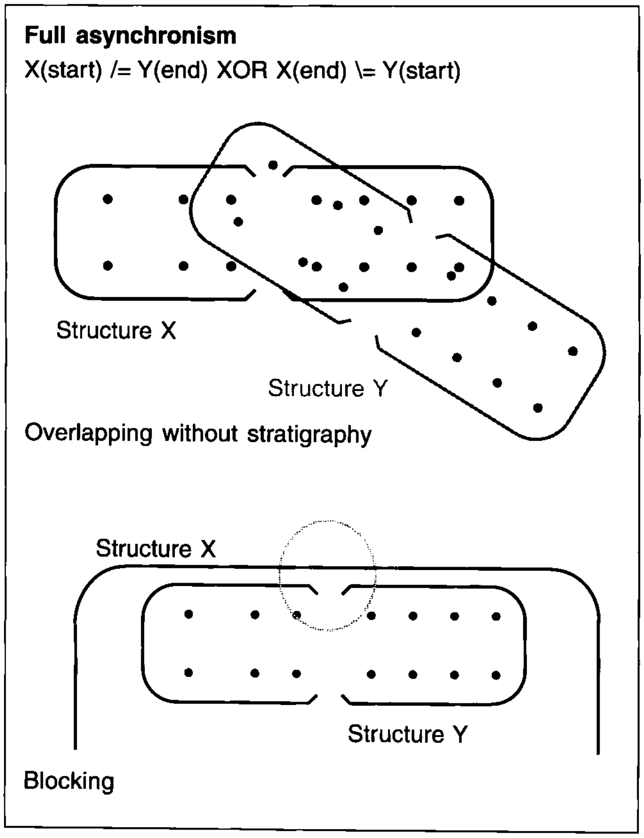

Fig. 3. Full asynchronism. Examples of observations and the logical expression.

out being able to identify which is/are older or younger. It is possible to have partial asynchronism, where the observations only allow one to say that the entities cannot have existed simultaneously for at least part of their lives as for example when two structures cannot have been founded at the same time. In this case the result is the following relationship:

X(start) / Y(start) XOR X(start) \ Y(start) (5)

To this class of observations belongs the temporal differentiation of structures on the basis of contrastive orientation or alignment, which, according to how great the difference is, may be more or less reliable as evidence. Markedly different alignments between buildings within the same, otherwise regular farmstead make it at least doubtful that the buildings were constructed at the same time.

There can also be examples of complete asynchronism, where two structures undoubtedly never existed at the same time, giving the relationship:

X(start) /= Y(end) XOR X(end) \= Y(start) (6)

Observations that reveal full asynchronism include overlapping without stratigraphy, and features that block one another. Both of these observations, like the observation of difference in alignment, belong to the group of simple, direct observations. A complex, derived indication of asynchronism is the identification of what one can call functionally identical structures within the same farmyard, such as longhouses and the boundary fence of the yard. Here one can assume that only one of the structures within each functional assemblage can have been in use at any one time.

Synchronic observations

Diametrically opposed to the asynchronic observations, evidence of synchronism provides information about contemporaneity (Figs. 4-7). One can distinguish between several different forms of synchronism, of which the most frequently encountered is what is referred to here as general synchronism. This means that two features existed simultaneously for some part

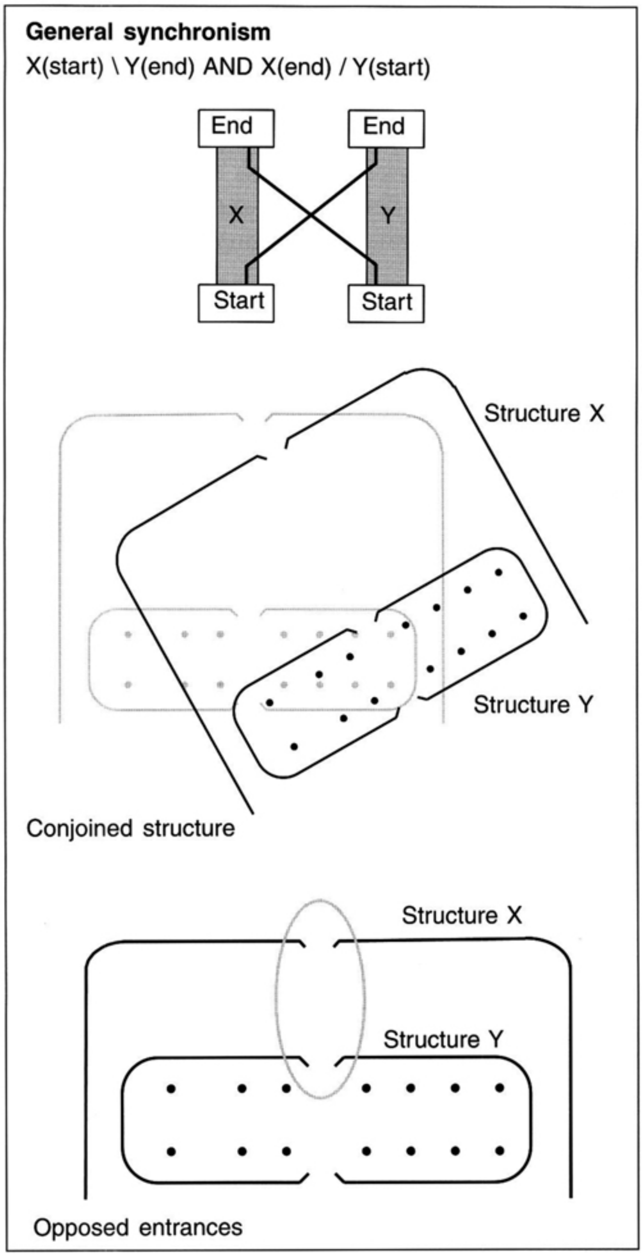

Fig. 4. General synchronism. Examples of observations, the logical expression, and the graphical representation.

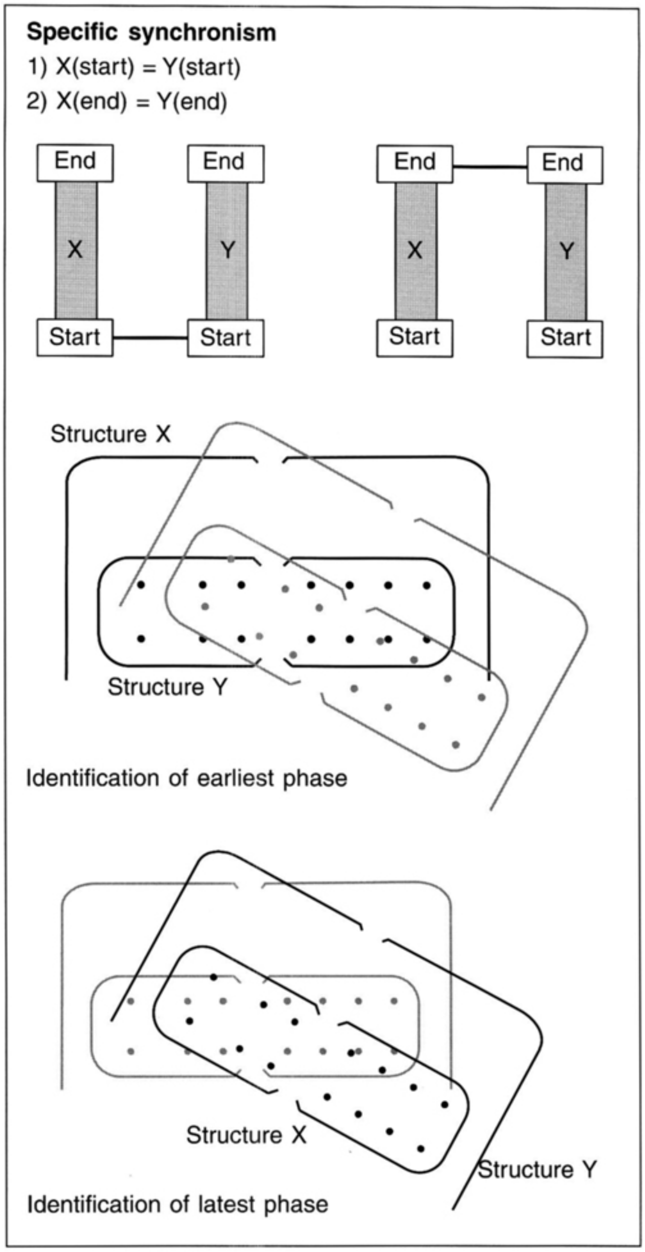

Fig. 5. Specific synchronism. Examples of observations, the logical expression, and the graphical representation.

of their life-span but no more precise information is available. This involves the relationship:

$$X(\text{start}) \setminus Y(\text{end}) \text{ AND } X(\text{end}) \,/\, Y(\text{start}) \quad (7)$$

As examples of the simple, direct observations, which involve this type of relationship, we can cite conjoined structures, and entrances in fences and small buildings directly opposite the doorways of longhouses. In some cases agreement in alignment is found as an argument for the concurrent existence of the entities, although this evidence is very uncertain. Where a fence is shared by two farmsteads, there is general synchronism, on the basis of the fence, between the two farmsteads. Amongst the more complex, derived ob-

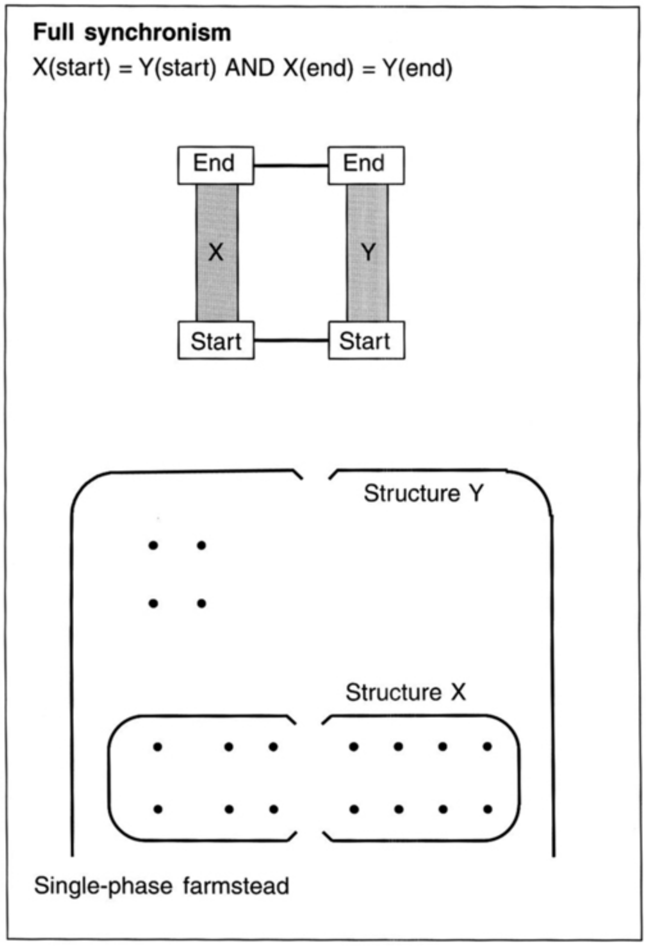

Fig. 6. Full synchronism. Example of observation, the logical expression, and the graphical representation.

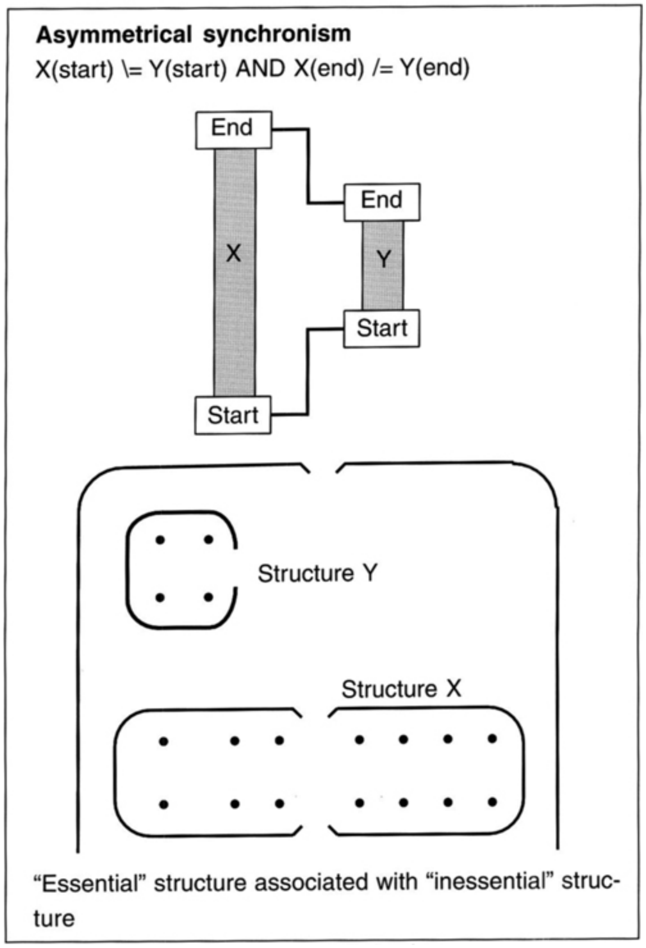

Fig. 7. Asymmetrical synchronism. Example of observation, the logical expression, and the graphical representation.

servations, the association of several entities with a particular phase of a farmstead is by far the most important of the indications of contemporaneity. This involves the interassociation of a large number of minor observations, which in methodological terms is an extension of the identification of the entities. If the farmsteads exist as single-phase phenomena without later disturbances, free of earlier structures and well preserved, both the identification of entities and the interassociation of fences, longhouses and minor houses inside the farmyard is a relatively simple process. The situation is quite different, however, in areas with many overlapping settlement traces, where it is often difficult to assess which fences are to be associated with which longhouses. In these cases the identification of both entities and farmsteads frequently ends up based upon references to the image of Iron-age farm structures and buildings that has been created during the last 35 years' area excavations.

If there are indications that all the structures were either raised or demolished at the same time it is possible to be more precise about synchronism, and one can then operate with a specific synchronism represented by the relationships:

$$X(start) = Y(start) \quad (8)$$

for structures raised at the same time, and:

$$X(end) = Y(end) \quad (9)$$

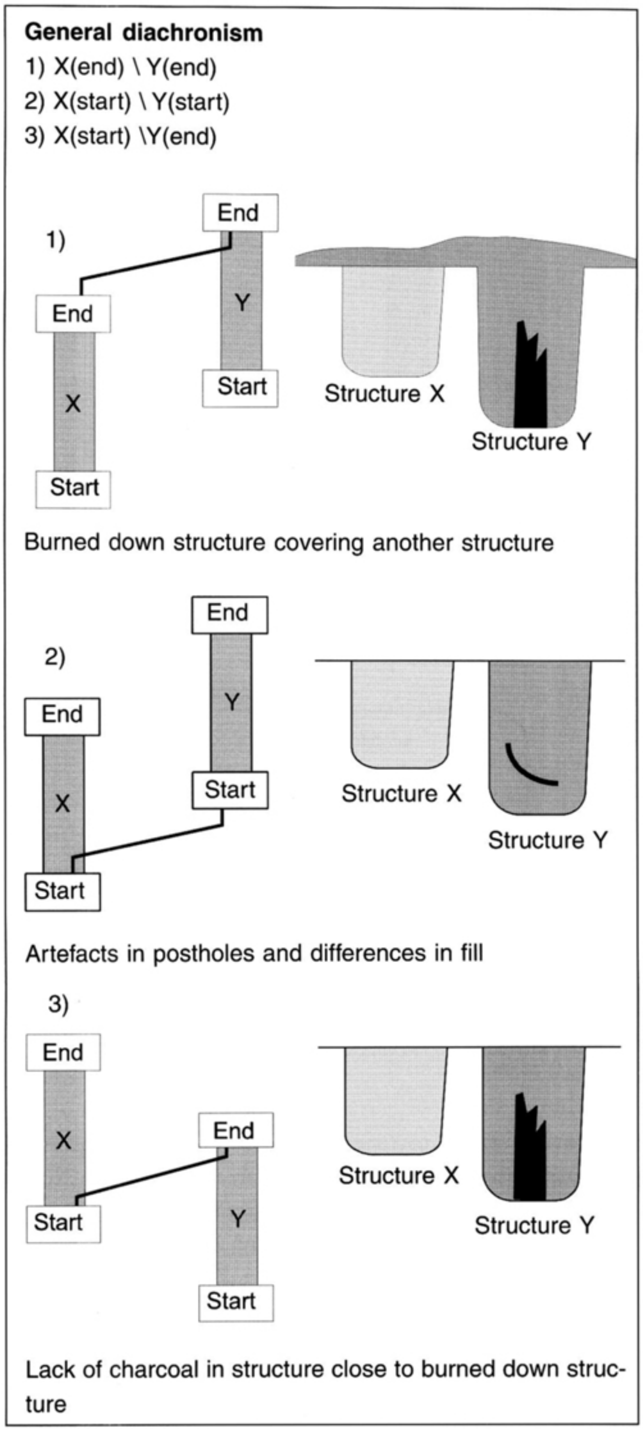

Fig. 8. General diachronism. Examples of observations, the logical expression, and the graphical representation.

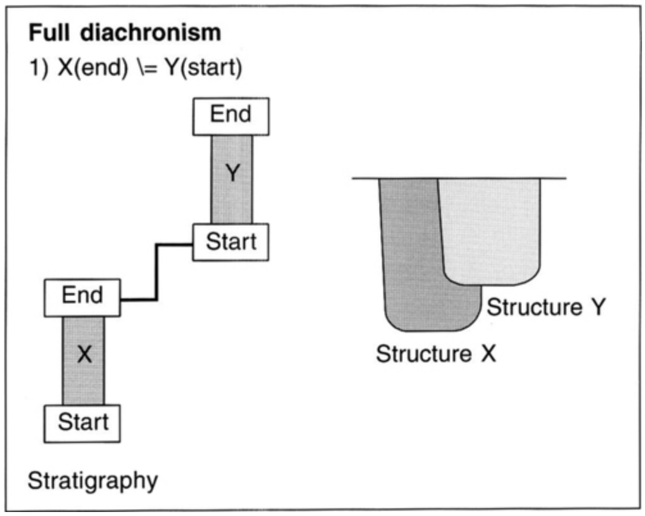

Fig. 9. Full diachronism. Example of observation, the logical expression, and the graphical representation.

for structures demolished at the same time. Observations which imply relationships of this type will often be of the complex, derived type, such as the identification of the earliest and the latest phase of structures in the history of a farmstead. In the intermediary phases of the farmstead there can, of course, be no certainty that longhouses and fences were replaced at the same time.

Where the structures were both raised and demolished at the same time, we have full synchronism, giving the relationship:

$$X(start) = Y(start) \text{ AND } X(end) = Y(end) \qquad (10)$$

Full synchronism is found between what we can call "essential" structures within a single-phase farmstead. By "essential structures" is understood those structures which define the farmstead and which can be assumed to have existed throughout its life-time, i.e. the longhouse and the boundary fence.

The final form of synchronism to be treated here is called asymmetrical synchronism. This form of relationship occurs when the life-span of one feature lies within that of another feature but does not necessarily extend over the whole of that period. Formally, this involves this relationship:

$$X(\text{start}) \backslash= Y(\text{start}) \text{ AND } X(\text{end}) /= Y(\text{end}) \qquad (11)$$

Asymmetrical synchronism is, as the name implies, an asymmetrical observation. It typically arises where a supposedly "essential" structure is found in association with an "inessential" one. For example, a stack barn may be found within the farmyard of a single-phase farmstead. In this case the barn can be assumed to have existed within the life-span of the longhouse and the farmyard fence, but not necessarily throughout the whole of that period. When a farmstead has several phases, features, which cannot necessarily be related to specific structures, can similarly be assumed to have had a functioning life, which at least does not fall outside the life-span of the farmstead. It must be emphasised that the "inessential" structures have to be unambiguously associated to some specific "essential" element for asymmetrical synchronism to be invoked. In general, the observations, which lead to asymmetrical synchronism, have to be classified as complex and derived.

Diachronic observations

With the information they provide about the temporal sequence, it is the diachronic observations that add movement to the settlement picture (Figs. 8-9). Traditionally, a diachronic relationship between two entities is described as either an "earlier than" or a "later than" situation, but just as in the survey of asynchronous and synchronous observations it is also necessary here to sharpen up and subdivide the terms in question.

General diachronism comprises those cases in which the observations indicate that one feature was either raised or destroyed before or after another one, but without the temporal sequence between the two being revealed in any other way, and with a degree of overlap remaining possible. In principle this involves three different types of observation. One results in relationships between the end dates of the structures:

$$X(\text{end}) \backslash Y(\text{end}) \qquad (12)$$

Another leads to relations between the start dates:

$$X(\text{start}) \backslash Y(\text{start}) \qquad (13)$$

And the last type of observations result in the start date of one structure being linked to the end date of another structure:

$$X(\text{start}) \backslash Y(\text{end}) \qquad (14)$$

Diachronism implies relationships of the earlier-than/later-than type, and thus asymemtrical observations.

A burned down structure whose charcoal layer covers another structure is an example of diachronic observations which concerns the end dates of features, as the structure covered must have ceased to physically exist before the other structere was destroyed in the fire.

As an example of diachronic observations which concern the start date of the features, one could point to particular differences of fill. If the fill in the postholes of a structure contains higher concentrations of artefacts and dark culture-layer material while another structure in the same area has a light fill with no finds, this can be used as evidence that the structure with the light fill was built first, especially if it appears probable for some other reason that the two structures are temporally close to one another.

Differences of fill can also be used as an example of observations, which yield diachronic relationships between start and end dates. If one has traces of a building that had burnt down, while another structure in the same area, ideally one similar in date, does not have any charcoal in the postholes, one can infer with some reservations that the structure without charcoal was erected before the other structure was burnt.

Another form of diachronism is what we can call full diachronism, when two features have not existed simultaneously at all. Fundamentally, this is a matter of a combination of the general diachronism just discussed with full asynchronism, but since a very important and extensive group of observations from excavations, namely the cutting of one feature by another (often called stratigraphy), involves relationships of this type, it is distinguished here as a separate type. Since the actual start and end dates, as noted above, do not in logical terms belong to the life-span of the entities, the formal expression of "earlier than" is:

$$X(\text{end}) \backslash= Y(\text{start}) \qquad (15)$$

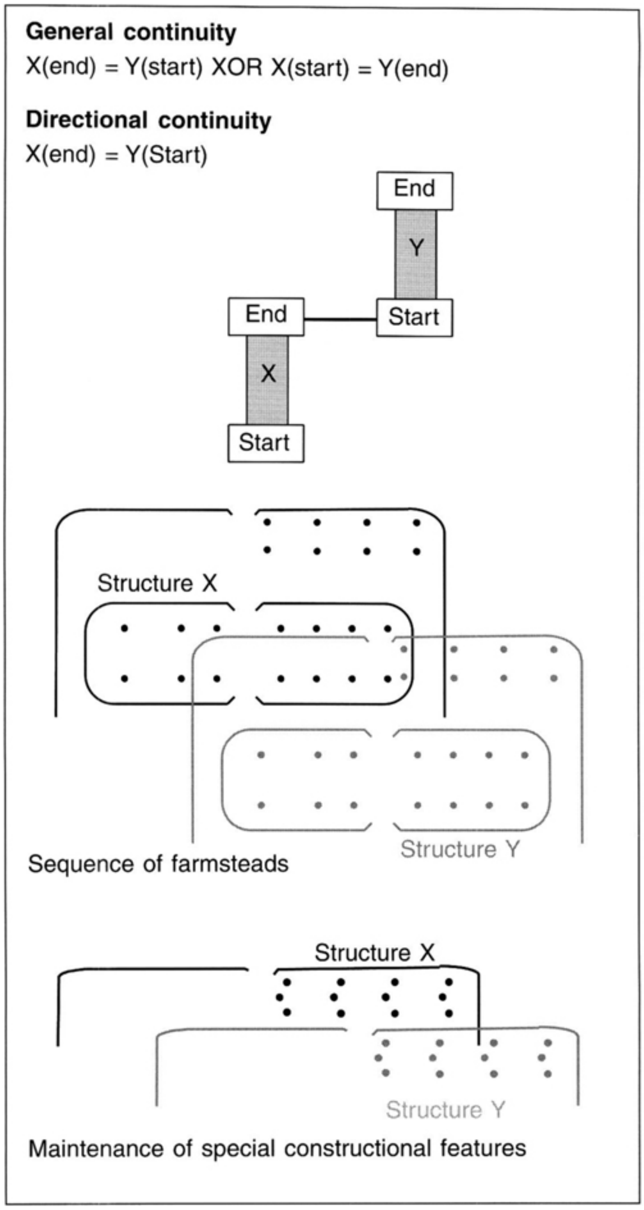

Fig. 10. Continuity. Examples of observations, the logical expression, and the graphical representation.

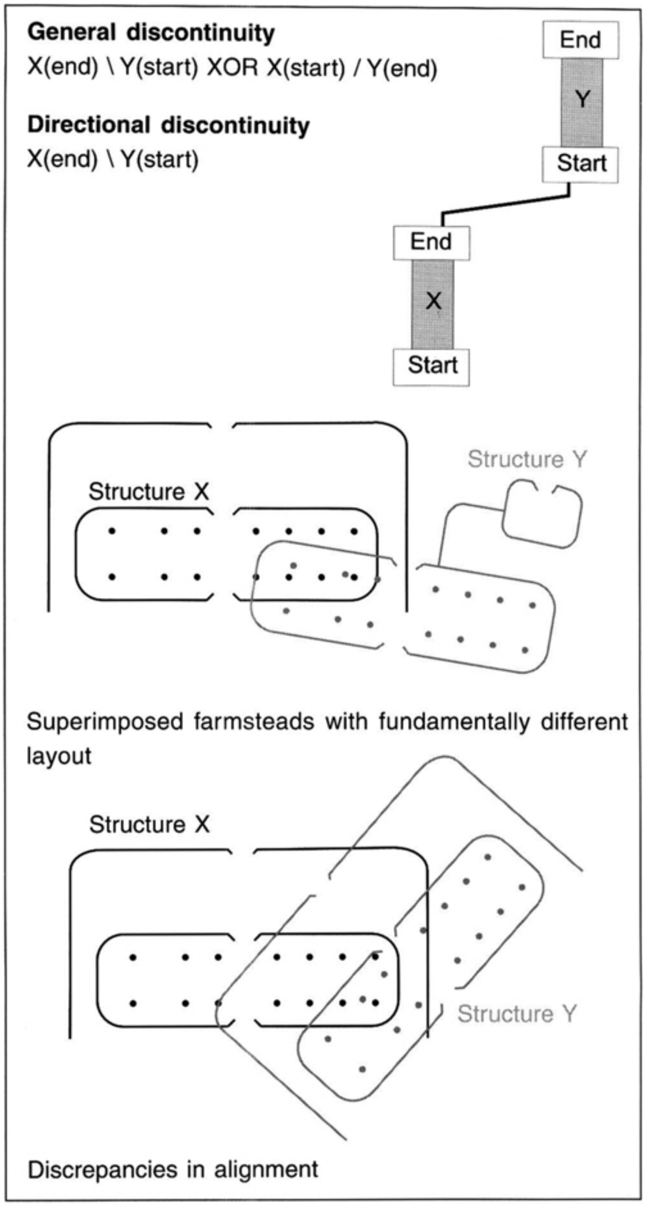

Fig. 11. Discontinuity. Examples of observations, the logical expression, and the graphical representation.

Observations implying continuity

It is the identification of continuity, which practically by definition validates the cohesion of the model of development produced (Fig. 10). *Continuity* is here understood as that one feature follows immediately after another without any temporal overlap. Where the temporal sequence between the two features is not known, the relationship appears as:

$$X(end) = Y(start)\ XOR\ X(start) = Y(end) \qquad (16)$$

Indicators of continuity can be the maintenance of special constructional features in structures, which can be assumed to supersede one another, for instance a fence with a particular buttressing post construction, which is maintained through two phases. Continuity can often also be inferred within well-defined farmstead complexes. Here the different "essential" structures within each function group, i.e. the longhouse and the farmyard fence, can be assumed to be part of a continuous sequence. There was no time where the farmstead did not have a longhouse, for instance. Where temporal neighbours amongst the different types of "essential" structure can be identified one can also, in consequence, assume continuity. Generally, continuous relationships will be founded on complex, derived observations, as the identification of continuity presupposes a sort of genetic connection between the features. We try, one might say, to find the descendants of abandoned structures.

When indicators of continuity are combined with evidence about the temporal sequence between two features one can talk about continuity with a definite temporal direction. When X is succeeded by Y we obtain the following formula:

X(end) = Y(start) (17)

This definitely directional continuity will normally only be used when the entities in a farmstead have already been placed in a temporal sequence. Stratigraphically, however, it can also be demonstrated as a general rule, that when an earlier farmyard fence is replaced by a new one, the farmyard area is extended. If a high level of uncertainty is tolerated, successive extensions of fences can thus be treated as evidence of continuity with a definite temporal direction.

Observations implying discontinuity

The final category of observations comprises indicators that the life-spans of two or more features were separated from one another by a certain amount of time, which here is referred to as discontinuity (Fig. 11). In formal terms, this temporal separation produces the relationship:

X(end) \ Y(start) XOR X(start) / Y(end) (18)

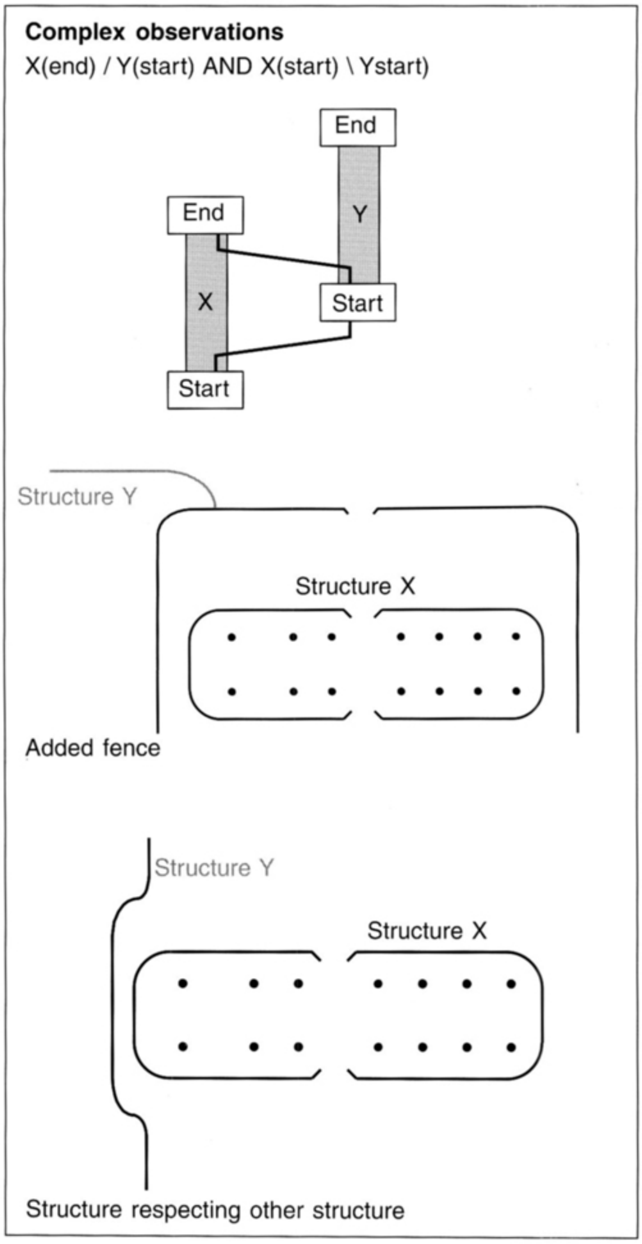

Fig. 12. Complex observations. Examples, the logical expression and the graphical representation.

In certain cases, discrepancies in alignment can be used as indicators of discontinuity, while amongst more complex, derived observations one can note the identification of superimposed farmsteads with fundamentally different layout. Both of these situations must normally be regarded as uncertain indicators.

Just like continuity, discontinuity is of especial significance when it is combined with diachronic observations, making it possible to sharpen up a /= - \= relationship produced by diachronic observations into a / - \ relationship:

X(end) \ Y(start) (19)

Composite and complex expressions

In the preceding sections the various principle observations have been surveyed. Some observations, however, contain information of a more complex character, as their evidence of the temporal relationship between two entities is best described as the product of the adding together of the types of relationship presented above (Fig. 12). This is the case, for instance, when fence lines clearly show that a fence has been joined on to a structure already in existence. In this case it is clear that the added fence was built after the structure to which it has been joined, but it is also clear that both structures existed at the same time. This, then, is a case of a combination of general synchronism and general diachronism. Formally, this situation can be expressed by chaining the logical expressions for general synchronism and general diachronism respectively with an "and" expression — a conjunction. The resultant expression is written thus:

X(start) \ Y(end) AND X(end) / Y(start) AND X(start) \ Y(start)

but since it is also necessarily the case that:

Y(start) \ Y(end)

the expression:

X(start) \ Y(end)

is logically implicit when we have the expression:

X(start) \ Y(start)

so that the formal expression can be reduced to:

X(end) / Y(start) AND X(start) \ Y(start) (20)

A similar situation arises in those cases in which one feature manifestly respects another one. It is clear that the features are contemporary, but it must also be regarded as likely that the respecting feature often was constructed after the feature it respects — this is, just as in the case of an added-on fence, a case of a combination of general diachronism in respect of the features' start dates with general synchronism.

In principle, it is also a matter of conjunctive chaining when two features are linked by several different observations. In this case too, all of the relational expressions must be given, and a composite expression of the relationships between the two entities in question is produced by linking the individual relationships with the conjunction "and". In certain cases it may be advantageous to reduce the often lengthy expressions thus produced.

Another problem which yields rather complex expressions results from the fragmentary and partial nature of the archaeological evidence. In several cases it is not possible to identify exactly which structure a given feature stands in a particular relationship to. For instance, minor houses may occur within the farmyard area of a multi-phase farmstead. It is not possible, in this case, to state which structures the minor houses in question are contemporary with, although it is at the same time obvious that the life-span of the minor houses lies within the whole life-span of the farmstead. If we do not view the farmstead as a discrete entity this is, in formal terms, an example of a disjunction: the minor houses existed at the same time as Structure X *or* Structure Y *or* Structure Z, and so on. Referring to our assumption that the longhouse is the principal structuring entity, it is most appropriate to formulate relationships to the longhouses. This, then, will involve the chaining of a series of expressions of general synchronism with "or" expressions.

THE TEMPORAL SORTING

With the above guidelines for translating excavation observations into formal, relative-chronological relationships, a foundation for working through a formalised relative-chronological sorting of the Iron-age settlement has been laid. In practice, the sorting is done by recording which observations link which features. Such recording can be done in a symmetrical matrix with all the identified structures listed on both axes and the identified, linking observations recorded in the boxes of the matrix. As was explained in the preceding sections, the excavation observations that are significant for relative chronology are then translated into totally unambiguous formal logical relational expressions, which in turn are able to form the starting point for the construction of a graphical model of the temporal development of the settlement.

In practice, there will often be several observations that link any two features. In such cases the relative-chronological implications of the different observations have to be compared. This sort of comparison can lead to four possible results:

1) The different observations may be of the same relative-chronological significance, i.e. they translate into exactly the same relational expressions. Such a situation will only corroborate the relationship between the two features.
2) The different observations may be contradictory. At the logical-operative level this will produce inconsistency, and the observations will therefore need to be re-assessed. If one of the observations proves to be significantly more trustworthy than the other, the dubious observation can be ignored. If this is not the case, both observations must be omitted.
3) One observation may have more detailed but not contradictory temporal implications than another. For instance, a case of general synchronism in which the two features concerned can move in relation to one another is a less exact expression than complete synchronism, which locks the two features firmly together. In such cases the formal relational expression for the less informative relationship can be omitted in further sorting.
4) Finally, discrete observations can supplement one another and sharpen up the temporal relationship between the features. In these cases the relational expressions of all of the individual observations must be retained in the further sorting.

Just as several relationships can appear between each structure, one can of course also encounter features whose mutual temporal relationship is not documented by any observations. In fact far the majority of features will appear unrelated. This partial character of the archaeological evidence means that the relational network that is built up over the temporal structure of the settlement does not issue in a completely interlinked model. There will be some flexibility in the network. Some features will be movable in relation to others, and there will often not be a unified network for the whole settlement: rather several smaller networks that remain unrelated to one another will exist. These are called "sequences" in the following.

It is clear that the individual sequences have to be dealt with on their own, both in the construction of the relational model of the temporal structures of the settlement and in the subsequent analyses of these structures. Later, with the aid of pottery chronology, building typology, or other external chronological systems, one may try to correlate the different sequences, but because of the lengths of the periods in the chronological systems this will always only be a matter of a relatively coarse relative dating compared with the very detailed sorting that is produced by the relative-chronologically significant observations from the excavation.

The problem of the flexibility of the system can be dealt with in various ways. We can modify some of our analyses so that we investigate the question of how far a concrete temporal structure is consistent or inconsistent with the relational network as it appears on the basis of the documented observations. These analyses take account of the flexibility in the relational network, and it is therefore unnecessary to modify the network.

In other cases we want our network to be the most probable image of the temporal structure of the settlement. Here it may be necessary to build in certain supplementary hypotheses to "shore up" the network. Examples may be assumptions that different longhouse phases will be of approximately the same duration, as also fences and perhaps other structures too. In the graph of the temporal structures of the settlement, this can be put into effect by attempting to give the longhouses the same extent, and likewise a consistent extent can be sought for the fences. It is obvious that these assumptions may introduce false temporal structures into the settlement or may hide real ones. It is important, therefore, that the assumptions used are explicitly formulated, and that their consequences are evaluated in the context of the resultant analyses.

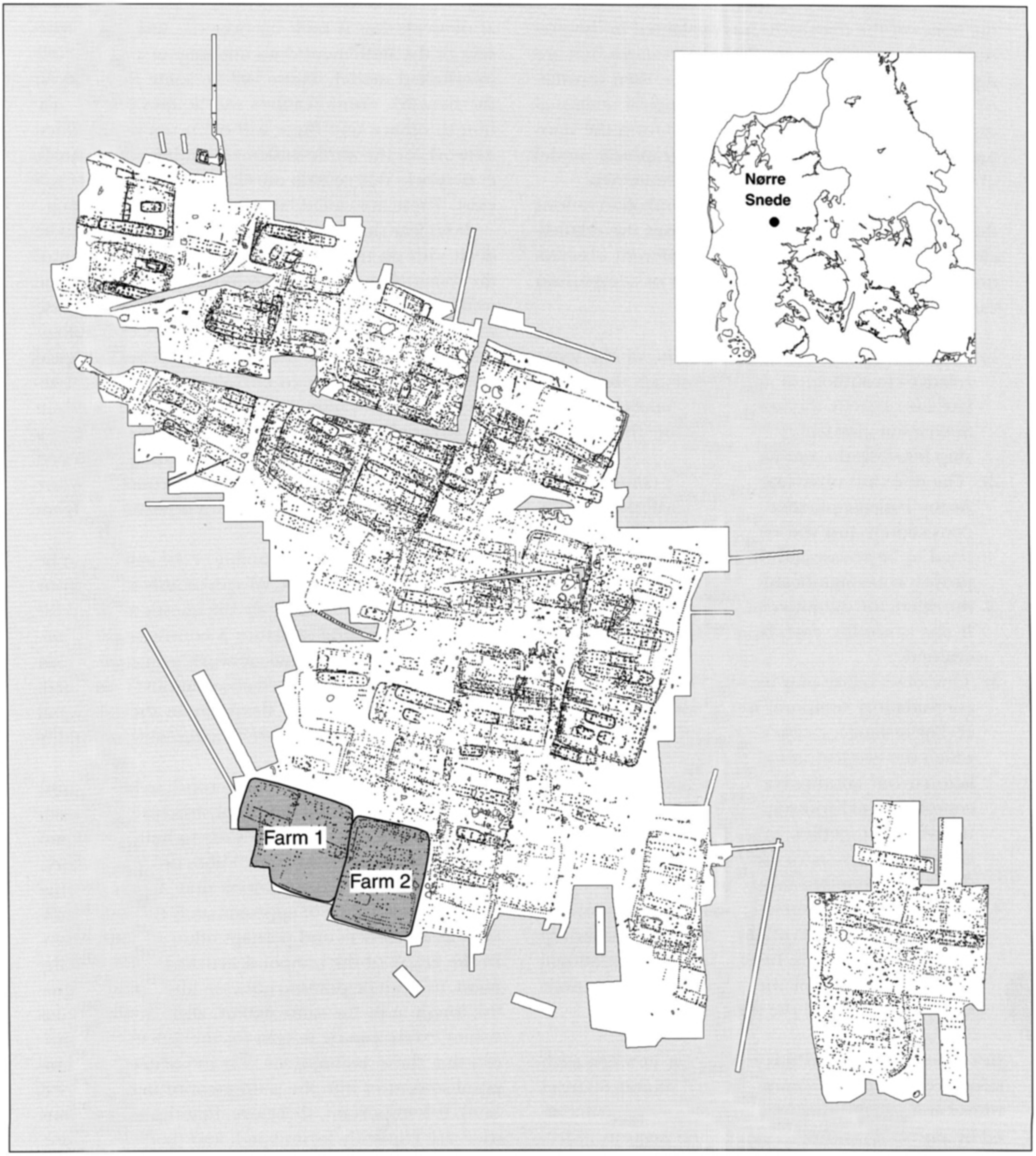

Fig. 13. Excavation plan of the Nørre Snede settlement with the two analyzed farmsteads marked. Scale: 1:2500

Fig. 14. Excavation plan of the analyzed segment of the Nørre Snede settlement with accentuation of the identified structures. Scale: 1:500

AN EXAMPLE OF APPLICATION IN PRACTICE

So far, an account has been given of a technique of relative-chronological sorting of the machine-stripped, area-excavated, Iron-age settlements with no preserved culture layer. In the following section the method will be demonstrated in practice, using part of the extensive excavations at Nørre Snede in Mid-Jutland (Figs. 13-14). The excavations of the settlement at Nørre Snede took place in the years 1980-86 under the direction of Torben Egeberg Hansen. During these seven years a total area of 80,000 m^2 was excavated, in which it is possible to trace the settlement in a temporally unbroken sequence from the 3rd centu-

Observation	Code	Relation
Contrastive orientation or alignment	a	X(start) / Y(start) XOR X(start) \ Y(start)
Overlapping without stratigraphy	b	X(start) /= Y(end) XOR X(end) =\ Y(start)
Blocking	c	X(start) /= Y(end) XOR X(end) =\ Y(start)
Functionally identical structures within the same farm	d	X(start) /= Y(end) XOR X(end) =\ Y(start)
Identification of farm phase	e	X(start) /= Y(end) XOR X(end) =\ Y(start)
Opposed entrances	f	X(start) \ Y(end) AND X(end) / Y(start)
Conjoined structure	g	X(start) \ Y(end) AND X(end) / Y(start)
Identical orientation	h	X(start) \ Y(end) AND X(end) / Y(start)
"Inessential" structure associated to several "essential" structures	i	X(start) \ Y(end) AND X(end) / Y(start)
Identification of earliest phase	k	X(start) = Y(start)
Identification of latest phase	l	X(end) = Y(end)
Single-phase farmstead	m	X(start) = Y(start) AND X(end) = Y(end)
"Inessential" structure associated with "essential" structure	n	X(start) =/ Y(start) AND X(end) \= Y(end)
"Essential" structure associated with "inessential" structure	o	X(start) = \ Y(start) AND X(end) /= Y(end)
More artefacts in posthole and darker fill	p	X(start) / Y(start)
Less artefacts in posthole and lighter fill	q	X(start) \ Y(start)
Charcoal in structure in or near burned down structure	r	X(start) / Y(end)
Burned down structure in or among structures with charcoal	s	X(end) \ Y(start)
Burned down structure in or among structures without charcoal	t	X(end) / Y(start)
Structure without charcoal in or near burned down structure	u	X(start) \ Y(end)
Cuts	v	X(end) /= Y(start)
Is cut by	w	X(end) =\ Y(start)
Temporal neighbour in farm sequence	x	X(start) = Y(end) XOR X(end) = Y(start)
Maintenance of special constructional features	y	X(start) = Y(end) XOR X(end) = Y(start)
Successor in farm sequence	z	X(start) = Y(end)
Predecessor in farm sequence	A	X(end) = Y(start)
Succesive extension of fence	B	X(start) = Y(end)
Fence succesively extended	C	X(end) = Y(start)
Superimposed farmsteads with fundamentalle different outlay	D	X(start) \ Y(end) XOR X(end) / Y(start)
Discrepancies in alignment	E	X(start) \ Y(end) XOR X(end) / Y(start)
Fence with addition	F	X(end) / Y(start) AND X(start) \ Y(start)
Added fence	G	X(start) \ Y(end) AND X(start) / Y(start)
Respects	H	X(start) \ Y(end) AND X(start) =/ Y(start)
Respected by	I	X(end) / Y(start) AND X(start) =/ Y(start)

Table 1. List of observations and the formal expression of their chronological implications used in the analysis of the Nørre Snede settlement. Also so-called inverse observations are listed.

ry A.D. to the 6th or 7th. In the course of this period of four centuries there is a general tendency for the settlement to move from the south-east to the north-west, and in a provisional discussion of the whole site the village is divided into five main phases (Hansen 1988).

The segment, which will be analysed in this section, lies in the south-western corner of the excavated area within the second main phase of the settlement. This segment constitutes a well-defined unit consisting of two farmsteads with no physical or relational overlap with any structural traces that can not be assigned to these two farmsteads — in other words, this is a discrete sequence, and the area thus offers a highly suitable object of analysis. The state of preservation of the features within the area concerned can be described as averagely good. There are few disturbances, the roof-bearing posts have been found in all of the buildings, but the building walls and the fence-lines were found in more varied states of preservation, from completely preserved to seriously fragmented.

Within the area under consideration, seven longhouses have been identified (Longhouses I to VII) of

	Longhouse I	Longhouse II	Longhouse III	Longhouse IV	Longhouse V	Longhouse VIa	Longhouse VIb	Longhouse VII	Fence 1	Fence 2	Fence 3	Fence 4	Fence 5	Fence 6	Fence 7	Fence 8	Fence 9	Fence 10	Fence 11	Fence 12	Fence 13	Fence 14	Fence 15	Fence 16	Fence 17	Other 1	Other 2	Other 3	Other 4	Minor 1	Farm 1	Farm 2
Farm 2	.	.	.	o	o	o	o	o	.	.	.	.	.	i	o	o	o	o	o	o	o	o	o	o	o	.	.	.	o	o	.	..
Farm 1	o	o	o	.	.	.	.	.	o	o	o	o	o	i	.	.	.	.	.	.	.	.	.	.	.	o	o	o	.	.	..	
Minor 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	..		
Other 4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	..			
Other 3	.	.	.	.	.	.	.	.	.	.	.	n	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	..				
Other 2	.	.	.	.	.	.	.	.	.	.	n	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	..					
Other 1	.	.	.	.	.	.	.	.	.	n	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	..						
Fence 17	.	.	.	.	.	.	.	.	.	.	.	.	.	d	bd	.	g?	.	.	.	.	.	.	.	..							
Fence 16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	g			p	..								
Fence 15	.	.	.	.	.	.	.	k	.	.	.	.	.	.	.	.	.	d	d	d	d	d	..									
Fence 14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	d	d	d	Cd	..										
Fence 13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	d	d	Cd	..											
Fence 12	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	d	Cd	..												
Fence 11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	C?d	..													
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Fence 5	.	.	.	.	.	.	.	.	.	.	.	g	..																			
Fence 4	.	.	n	.	.	.	.	.	.	y	.	..																				
Fence 3	.	.	n	.	.	.	.	.	.	.	..																					
Fence 2	w	m	.	.	.	.	.	.	y	..																						
Fence 1	mg	.	.	.	.	.	.	.	..																							
Longhouse VII	.	.	.	Aqd	qd	qd	qd	..																								
Longhouse VIb	.	.	.	d	vd	zvd	..																									
Longhouse VIa	.	.	.	d	zvd	..																										
Longhouse V	.	.	.	zpd	..																											
Longhouse IV	.	.	.	..																												
Longhouse III	d	Awd	..																													
Longhouse II	Abd	..																														
Longhouse I	..																															

Table 2. Matrix of the relative chronologically significant observations linking the structures of the analyzed segment of the Nørre Snede settlement. The letters refer to the codes listed in table 1.

which one was subjected to total replacement of the roof-bearing post-sets (Longhouse VI(a+b)). Seventeen pieces of fence-line have been identified, while there are four stack barns including one special type, and finally a single minor building. The structures are distributed, as noted, between two farmsteads: Farm 1 to the west with three partially overlapping longhouses in a line along an east-west axis, and Farm 2 to the east with four longhouses and a relatively high degree of stability in the structure and position of the farmstead.

The observations which link the features of the farmsteads are presented in Table 1. The table illustrates extremely well the highly varied range of basic observations produced by area excavations, with virtually all of the types of observation described above being represented.

On the strength of the gradual shift that took place with Farm 1, each farm-phase can be treated as a single-phase structure, meaning that the majority of the fences can be assumed to have the same start and end date as the longhouses they are associated with. Exceptions, however, are Fences 3 and 4 pertaining to Longhouse III, where there is no certainty that both of them existed throughout the whole life-span of the building. The temporal sequence of the three farm-phases is demonstrated both by stratigraphical relationships between Longhouse I and Fence 2 of Longhouse II and also by the observation of hearth material in the one posthole from a roof-bearing post of Longhouse II which is located in the hearth area of Longhouse III. In general the structures of Farm 1 are clear, and their sorting unproblematic. The only observation which needs a little explication is indeed the chaining of Fences 1, 2 and 4 into a continuous sequence on the basis of a shared and peculiar constructional feature. The fences represent the so-called half-roof fence with two rows of roof-bearing posts of

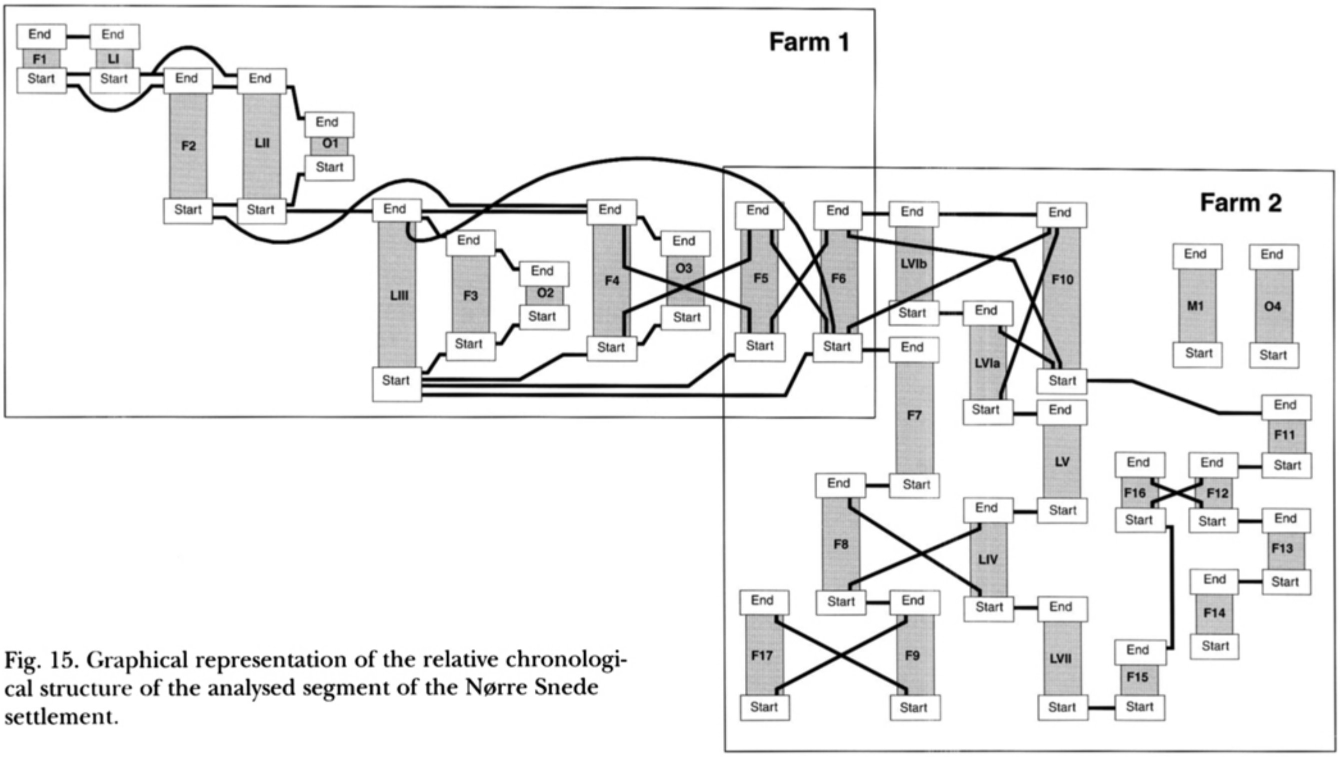

Fig. 15. Graphical representation of the relative chronological structure of the analysed segment of the Nørre Snede settlement.

which the inner and outer posts are equally deeply rooted, when by far the most common construction of this sort of fence has the inner roof-bearing posts dug deeper than the outer ones. One can argue whether this is really evidence for continuity, but the feature unquestionably indicates some genetic connection between the three fences.

Farm 2, with its greater locational stability and consequent high level of overlap of features, is significantly harder to deal with than Farm 1, especially in respect of sorting out the sequence of fence-lines as many of the fences are only partially preserved. Stratigraphy and differences of fill constitute the most important basis for sorting, although entrances aligned with one another and structural similarities also play a significant part. It has not been possible to place Minor house 1 and the special Stack barn 4 precisely within the sequence of development of the farmstead.

Farm 1 and Farm 2 are linked by a somewhat doubtful observation concerning Fence 6, the roof-bearing post-set of which shows that it must belong to Farm 2 although at the same time the fence appears to make a minor detour around Longhouse III of Farm 1, suggesting that it respects that building. This deduction is also supported by the fact that Fence 4 of Farm 1 was apparently built together with or joined on to Fence 6, and that fence 5 and Fence 6 may be seen as a conjoined structure.

After collecting the significant relative-chronological observations in this way, one can produce a matrix of the formal relationships between the structures identified on the basis of the principles formulated in the foregoing sections (Table 2). This matrix may then, in turn, provide the starting point for the construction of a graph of the development within the segment of the settlement under examination, as in figure 15.

A number of things can immediately be read from this graph. It is evident that the two farmsteads have quite different temporal structures. Farm 1 presents clear, well-defined phases, in which the structures are unambiguously associated with one and only one of the farmstead's three longhouse-phases. This pattern corresponds to the farmstead having been moved in each phase, involving the rebuilding of all the structures. Farm 2, in contrast, remained in the same place through all of its rebuilding phases. Here, as a result, the graph shows a far more intricately intertwined picture of the gradual, dynamic replacement of features, without clear, unitary phases.

POTENTIAL APPLICATIONS

The area analysed constitutes only a very limited segment of the Nørre Snede settlement, which is taken, furthermore, from an area of relative clear and uncomplicated structures. The real potential of the method, however, evidently lies in the analysis of larger and more complex sequences with extensive overlap of features, where it is in practical terms impossible to grasp all of the observations and their implications. The model in figure 15 can be regarded as the end result of a condensation and structuration of the relative-chronological entities of the complex and extensive data produced by area excavation. Here we have obtained a tractable graphic presentation and model of the temporal relationships between the entities of the settlement with a systematic method that facilitates work with much more extensive collections of data.

On the other hand, the sorted relative-chronological model can also be regarded as merely an intermediary result: a starting point for further analyses of the spatial and temporal structures of the settlement. In this regard, the observations implying continuity are of particular importance, as they render it possible to identify what we can call continuous sequences of development. These sequences are constituted of entities which are firmly tied relationally to other entities by being linked to them through observations of synchronism, by being in a relationship of contemporaneity, or by having both earlier-than and later-than relationships with other entities which are themselves related amongst themselves by relationships of contemporaneity. This means that all entities in such a continuous sequence of development are located within an unbroken span of time, with important consequences for the interpretation of the structures of the village. It is in fact the case that one must assume that there was a certain historical as well as some functional or semantic connection and mutual influence between the different entities in these sequences of development as reflected by the expressions farmstead-sequence (diachronic connection) and village phase (synchronic connection). This means that within each of these sequences of development there is the possibility of identifying connections that were genuinely meaningful for the prehistoric population, and it is these connections which are essential to us when we attempt to reveal the human aspects of the prehistoric sequence. A clarification of the structures in the village is an account of the character of and background to these "human" connections. The sequence of development discussed here is a simple continuous sequence.

To obtain the full and true benefit of the relative-chronological sorting, however, one needs a really thorough understanding of how the diagrammatic representation is to be read so that possible interpretations and uncertainties are not ignored. In the following sections, therefore, an attempt will be made to go through some of the problems that reside in the interpretation of the graphs, with particular focus on two potential applications: phasing; and analyses of the pattern of movement of the settlement.

Phasing

It is an absolutely fundamental precondition for studies of the spatial structure of Iron-age settlements that the occupation evidence accumulated through the centuries can be distributed amongst a series of temporal phases, ideally of as limited duration as possible, so that one can produce plans of more or less contemporary structures. It is telling that the more and the shorter phases it is possible to distinguish, the more detailed the analyses of the structure of the settlement one can, in principle, carry out. In practice, however, one quickly faces a conflict between the desire for short phases and the increasing uncertainty that a higher level of detail involves.

In the full or partial phasings of Iron-age settlements that have been produced up to now, one can distinguish between two methodologically different approaches. One takes its starting point from an established chronological system to sort the settlement entities into temporally well-defined periods. This method can be seen in practice particularly in respect of the extensive excavations in northern Germany (e.g. Schmid & Zimmermann 1976). The other meth-

Fig. 16. Phasing of the analysed segment of the Nørre Snede settlement. Scale 1:1000

od starts from the observations concerning the relative-chronological relationship between the entities of the settlement in question, on which basis a temporal sorting of the features is undertaken. In this case, a phase is understood as a group of entities that existed at the same time, and Danish archaeology has produced several exemplary applications of this method, most clearly in the analysis of the village of Hodde (Hvass 1985).

It is significant that if one starts from the ceramic evidence, one is obliged to have a very well-developed chronological system with short pottery phases in order to have any hope of catching a glimpse of spatial structure. On the other hand, the method based upon the observations from the excavation itself concerning the relative sequence of the features relies upon a good state of preservation and a large number of relationships between individual structures. It does, however, make it possible to achieve an extremely detailed image of the development and structures of the settlement.

The method presented here is manifestly closely associated with phasing based upon the observations during excavation. The relative-chronological sorting, however, is not truly a phasing, rather a detailed picture of the dynamic development of the settlement. It is a phase-less image, emphasising gradual development. It is, however, a relatively easy matter to use the graph of the relative-chronological sorting to construct both temporally extensive phases and "momentary phases": i.e. "phases" which offer a snapshot of simultaneous entities, as a horizontal section through the graph should in principle produce such an image. Those structures that are cut through were standing at the same time. A temporally extensive phase can, consequently, be understood as consisting of those structures which are present in the space between two such horizontal sections.

In practice, however, phasing is not such a simple and unambiguous process. The problem resides in the flexibility of the graph referred to above. There will often be quite significant uncertainties, particularly in the case of sequences with large numbers of entities. The use of supplementary hypotheses is, as a result, often a vital precondition for a phasing. As for loosely located entities, the most valid solution will be not to assign these entities to a definite phase.

With these guidelines, the phases can now be identified by placing horizontal lines across the graph (Fig. 15). In principle we have complete freedom as to where we place the lines. For the analysed segment of the Nørre Snede settlement, five lines were drawn through the graph resulting in five phases as shown in figure 16.

It must be emphasised that a phasing following the guidelines suggested here can only be undertaken in respect of each sequence individually, so that several different continuous sequences of development within a sequence can cause problems. If one is to establish phases across sequences other dating methods have to be introduced and attempts to establish momentary phases abandoned. The value of momentary phases thus resides first and foremost in revealing the development of individual farmsteads.

The pattern of movement

The relational treatment of the observations from area excavations results, as already noted, in a relative-chronological sorting of a very high level of detail and with the potential to catch the dynamic replacement of entities of the settlement. With this, it also becomes a realistic proposition to undertake systematic analyses of the movement of the settlement itself, and thus to approach closer to a solution of the problem of how and why the villages shifted. It is, for example, still relatively unclear how far this affected whole villages or whether it was solely a matter of a gradual relocation of the individual farmsteads. An answer to this question is obviously of great importance to our understanding of the organisation of agrarian settlements, and will give some indication of how well developed the village community was.

Another crucial question, which it may be interesting to consider, is that of to what extent the Iron-age farmstead actually is to be perceived as a unilinear phenomenon. The traditional discussion of Danish Iron-age settlements seems to assume, more or less explicitly, that it is the same farmsteads, in other words the same discrete families, that functioned throughout the life-time of the village. This presupposes a definite pattern of inheritance through which the farmstead is passed down a direct line. In this explan-

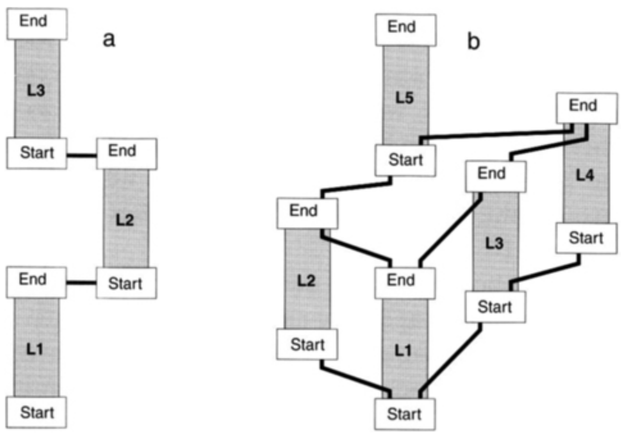

Fig. 17. Graphical representations of the basic structures in a) a unilinear and b) a multilinear sequence of development.

atory model we lack any explanation of the mobility of the farmstead. A possible alternative interpretation could be that it was the inheritance rules themselves that caused the high level of mobility within the settlement. If, for instance, at the point of inheritance, there were a division of the land between several heirs, this would serve to explain the construction of new farmsteads, and the high degree of dynamism within the settlement at the same time. The construction of a new farmstead for one of the children of the family could even take place before the death of the parents, for instance when the son married. If this model is correct, the unilinear concept of the farmsteads has to be dropped.

The production of an accurate picture of how the farmsteads move would thus offer very important information on Iron-age society, and with the relative-chronological sorting model presented here it should — as long as the basic evidence available is of sufficiently good quality — be possible to determine which patterns of movement we are faced with. This principle is based upon the idea that we can view the relational graph as a sort of legible text. What we are seeking to identify is the presence of particular "sentences" or compositions. In figure 17 an example is shown of how both a unilinear and a multilinear sequence of development will appear in the graph of the relative-chronological sorting of the entities of the settlement.

It is impossible to get any closer to an answer to these questions from the segment of the Nørre Snede excavation discussed here: the sample is simply too small. To reveal the character of mobility within a settlement would probably require a virtually complete analysis of a village, both because there would otherwise be no certainty that the patterns identified were representative, and because the observations that link the different farmsteads together are often seriously uncertain, so that a large body of data is essential for the results to be regarded as statistically significant.

The analyses of the temporal structures can of course be extended and formalised, while there may also be other questions that it would be interesting to explore. It is hoped, however, that the examples presented here will have shown what sort of prospects reside in undertaking such very detailed relative-chronological sorting of the evidence from machine-stripped area-excavated Iron-age settlements.

CONCLUSION

With the introduction of area excavation, a body of data of quite new character was also produced. Now that the major excavation campaigns of the 60's, 70's and 80's are beginning to be worked upon, the need has arisen for new methods that can cope with and make use of this new type of body of data. The above is an attempt to establish a method for the first stage of post-excavation analysis, the relative-chronological sorting.

As with many other archaeological objects, it is particularly spatial and temporal structures that are the focus of attention in respect of the Iron-age settlements. In the case of these sites, spatiality is already dealt with in the recording phase. The chronology is a more difficult matter, and it is this problem which the technique presented here is aimed at. The technique is capable of producing a very detailed graph of the relative-chronological relationships between the structures identified as it is possible to translate any conceivable observation about the temporal relationship between two features into a logical expression, which can then form the basis for a systematic sorting of the entities of the settlement. This, then, is not just a formalised reproduction of the excavation observations but also an analytical tool.

The most interesting prospects, however, reside in the scope for undertaking detailed analyses of the temporal structures of the Iron-age settlements after the relative-chronological sorting. Through total analyses of the larger, area-excavated, shifting villages, the method is probably capable of giving a more accurate view of the mobility of the settlement and thus, possibly, also of shedding some new light on to vital aspects of Iron-age society.

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