



IMITATIVE EXPERIMENTS AND ENVIRONMENTAL INTERPRETATION

THE ROLE OF REGIONAL ETHNOLOGY AND
THE HISTORICAL-ARCHAEOLOGICAL RESEARCH CENTRE AT LEJRE
IN ENVIRONMENTAL INTERPRETATION AND EDUCATION

BY HANS-OLE HANSEN

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H. Hans Jørgensen

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PAPER GIVEN AT THE
INTERNATIONAL STUDY CONFERENCE
ON THE ROLE OF REGIONAL ETHNOLOGY IN
ENVIRONMENTAL INTERPRETATION AND EDUCATION

BY HANS-OLE HANSEN, DIRECTOR
HISTORICAL-ARCHAEOLOGICAL RESEARCH CENTRE
LEJRE AUGUST 16, 1976

The role of regional ethnology in environmental interpretation and education.

THE FIELD: THE PAST IN THE FUTURE.

It is generally believed, that the past concerns only art treasures, buildings, crafts left by our ancestors and has nothing to do with the Future.

An art and history museum is a shrine where objects are kept. Modern landscape is another kind of museum where objects are also kept - hidden in the soil or standing as monuments on the ground, - even living objects of the past are kept by nature in this museum.

The present is an integrated part of this museum and adds another dimension to the 'collection'. The days to come will do the same.

Because of the total integration of man in this 'environmental museum' he does not really see how much is created by past generations and past events in nature.

HISTORY

Man relies only on a common physical 'frame of reference'. He presupposes, that everybody speaking his language will understand his feelings, words and doings. Thus, we use the past as a common language. If not, we would communicate like small children: just talking about events and motions right now. History is created by present minds in present brains. If mankind dies out, his history is forever gone. In our thinking and philosophy we mould and change our ideas of the past. The interpretation of the remains from the past is geared to our spiritual and social life in the present.

This brings history from the museums, art galleries and petrified ruins; from the volumes, inscriptions and depictions

right into the daily life of the present!

History again becomes a most important tool of humanism, for creating awareness, and for keeping up a common language.

ETHNOLOGY

Ethnology is the study of culture and society in general. In Anglo-Saxon language ethnology is called anthropology.

Social anthropology studies social, political, economic and ritual organization, as well as cultural values and evaluations.

Cultural anthropology is based on human experiences, skills, behaviours, statements, and social institutions. Cultural anthropology, therefore, is very broad in its scope, and fields such as technology, art, aesthetics and linguistics are often included.

Ethnology (anthropology) includes disciplines such as archaeology, history and branches of the natural sciences such as palaeobotany, palaeozoology and palaeoclimatology.

Regional ethnology studies the similarities and differences characterizing a region or a locality as compared to other regions or other localities. Hereby the differences or similarities created by the environment become of fundamental interest. Not only the natural environment, and not only the cultural environment, but a totality of natural and cultural factors are mutually influential.

In regional ethnology this is best expressed, i.e. communicated, and studied, through the aspect of cultural ecology and by the use of 'imitative experiments'.

Cultural ecology is concerned with the transmission of energy from nature to human societies. Cultural ecology deals with the environmental energy that is accessible to man,

seeking to adjust general principles to given cultural milieus. Thus, cultural ecology deals with collective human households and forms of energy and how that energy offers various population subgroups the foundations for their ways of life.

Imitative experiments ('experiments in archaeology') are controlled experiments based upon the fact that natural forces will react upon a technical process in a recreated experimental situation parallel to a supposed reaction in the original situation. If, through the analysis of the produced experimental material, - both 'subjective' and 'objective' material, - a direct imitation is shown, a number of observed phenomena may be given a higher value in the interpretation and explanation of the past situation. The observed experimental data are of great value to disciplines such as archaeology, ethnology, history and palaeozoology.

THE STUDY CONFERENCE IN THE NETHERLANDS 1975:

ECOLOGY AS AN APPROACH

In the Netherlands in 1975 authorities took the initiative to organize - in co-operation with the Council of Europe - an International Study Conference on Environmental Education in rural and urban settings. At this conference, specialists from ten countries were confronted for the first time with the whole range of practical examples of environmental education methods available in Europe.

During the conference the role of ecology in environmental interpretation and education was elucidated through papers and site visits to examples of 'School and Children's Garden Service', a camp school, visitor centres and 'The Institute for Environmental Education at 'Floriade', Amsterdam.

It was shown that biology should be taught through observation.

Live animals and plants were the subjects for this.

The 'look-and-learn' method is based on:

- The importance of learning to discover for oneself.
- Observational skills are more important than exercising the memory.
- Knowledge from first-hand experiences is more important than knowledge from theoretical learning.
- Appreciations of overall systems should replace the learning of isolated facts.

The 'School and Children's Garden Service' operates on four educational levels, geared to the childrens' age groups:

1. Learning how to treat animals and plants (pre-school).
2. Contact with animals, plants, soil and water, learning to observe (primary education).
3. Patterns of relationships existing between plants, animals, man, soil and climate (secondary education).
4. The social factors behind responsibility for interventions with nature (education of lasting value).

Further insight into didactics and methodology was gained from a paper on 'The Hannover Centre for School Biology', West Germany.

Here examples for teaching methods in botanical gardens were presented.

The Centre functions in four divisions:

1. Supply and loan (complete or individual teaching packages).
2. Assistance for school gardens.
3. Courses for school children.
4. Teacher training and "ad hoc" course projects.

One of the conclusions is that botanical gardens need to enlarge their scope to encompass environmental education as a whole.

An instructional aid for the teacher is distributed before the actual delivery of material. The loan service makes it possible for schools to borrow complete aquaria, measuring instruments and so on. The loan service is an indispensable help in biology instruction. Among other things the central loan service makes natural science instruction cheaper.

'School garden help' aims at the caretaking of school gardens, i.e. providing seeds and plants in the spring and working aids for the basics of gardening.

Gardening pedagogy finds itself on an untouched continent:

- What impact does dealing with something alive have on the development of human beings?
- Can gardening serve as therapy?
- What are the criteria for basic courses in gardening?
- What are the reasons for decreasing interest in cultivation and caretaking?

Student courses are carried out. Here all teaching is object-orientated.

For such courses the Centre's garden area is heavily supplemented. The material suffices for studies at the university level.

A number of important generalizations have been reached e g:

- The instruction by a teacher other than the class teacher creates a strong social impetus in the class.
- Non-biologist teachers also register for instruction.
- Only demonstrative-experimental instruction is offered.
- Each topic can be meaningfully treated in every age group and on every school level.

It was evaluated what can be carried over from this for the botanical gardens.

An important key to the use of the 'Hannover Centre for School Biology' is the teacher's training, and the ways in which this training is performed.

A paper on the problems of biology teaching in large cities was given. Based on examples from a comprehensive school in East-London, England, and from the in-service training of London's science teachers and primary teachers.

The completely urban setting presents great problems.

What does the theme "Conservation of resources" mean to a group of children raised in a consumer society?

Living organisms were introduced for the first time in a classroom situation. Both traditional teaching (classification, difference between animals and plants), and a variety of additional studies on feeding, growth, food chains, adaption, etc..

Plants and flowers were used for home economic courses and as inspiration for drawing, and textile and design in art. A plot of ancient wheat was used by both geographers and historians in addition to biologists.

Useful side-effects were the children assisting in the care of animals and plants, which helped to develop reliability and a sense of responsibility.

In recent years many of these ideas have been further developed through national curriculum projects.

THE STUDY CONFERENCE IN DENMARK 1976:

THE ETHNOLOGICAL APPROACH.

Comparing the ecological aspect with the ethnological aspect it is clear that:

- Many of the didactic and methodological problems and possibilities are the same.
- - The ethnological aspect promotes environmental awareness as well as the ecological aspect.
- The ethnological aspect brings time into the study, hence a good insight into the great changes of man's society as well as his environment.
- This aspect also includes the non-biological part of our environment, i.e. house-structures, roads, streets, bridges, constructions, as well as the tools and working processes.
- The ecological aspects presented at the Netherland conference included man and environment.

Any change of the environment also involves time and space dimensions. Regional ethnology operates within a given time and space-perspective.

The problem of using the ethnological aspect is, that we need to abandon museology, archaeology, history and ethnology as such.

The same demand is seen in the generalizations made by the 'School and Children's Garden Service':

- Knowledge from first-hand experiences is more important than knowledge from theoretical learning, and
- Appreciation of overall systems should replace the learning of isolated facts.

Generalizations which according to Danish experiences might apply to the ethnological aspect as well,

The tools and methodology of the various disciplines (archaeology, ethnology, palaeo-zoology, cultural ecology, imitative experiments etc.) are not touched by this. The disciplines as such must be carried on strictly by specialists,

while the didactics of interpretation and education for creating environmental awareness must start out from what was stated in the beginning of this article:

- The past is recreated and carried on by present minds.
- ➔ - Most minds deciding the fate of our environment are non-specialist in respect to regional ethnology.

Chronology is a way of structuring the 'present past'.

It is more important for a man to realize that his grandparents and the Ice-Age have something to do with the present environment, than to punish a child for maintaining that his or her grandparents lived before the Ice-Age!

In the Netherlands in 1975 the 'Historical-Archaeological Research Centre', Lejre, Denmark, presented an ²example of environmental education based on ethnology. A 3-hour activity course for primary and secondary school children arranged by the Centre's "school service" was described. This course is best seen as a possible projection into education of cultural ecology (the transmission of energy from resources in the vicinity of a reconstructed setting in a given time period, in this example the Danish Iron-Age period (500 B.C. to 800 A.D.) and reconstructed technology (based on imitative experiments).

Between 5,000 and 8,000 students each year pass various "3-hour lines" at the Centre's School Service, also called 'historical workshops'.

AV-media used before or after the activity explain the changes in the environment eventually brought about by permanent activity which again will change the resources available to man, and thus man's society.

Basically the student activities are performed as at 'The Hannover Centre for School Biology', and the same generalizations have been made through our experiences since 1967.

If (on page 4) 'gardening' is substituted for 'historical workshop', generally, the eight statements extracted from the paper on the Hannover-Centre given by the Netherland Study Conference will cover the Lejre-Centre!

The weaknesses of the ethnological approach to environmental education when it does not use the 'workshop technique' as a didactic 'lever' are:

- History, - the Past -, is heavily outdated by present-day information (newspapers, TV, books, magazines). It seems 'old and useless'.
- Urban dwellers no longer have direct experience with items such as soil, plants, animals, fire, tools.
- Urban and rural dwellers become accustomed to the present uses of nature: mechanized farming, industrialized forestry, the "useless-land-made-useful-idea", the enormous waste of land for constructions of trafficsystems and new towns.
- Many people only know a few very intensified "recreative" areas containing discoteques, bars, motorboat racing, swimming pools and so on.
- No knowledge of the direct relationship between the use of local resources and the rapid changes of the local environment caused by that.
- The problem of the heavy impact of electronic and substitutional learning medias concentrated on highly specialized subjects.
- Teachers educated in various subjects have difficulty relating their own subject to other subjects.
- The problem of people generally believing in the experts

(planning, repair, or damage) and disbelieving their own insight.

- The general lack of practical skills not based upon electric tools and equipment, as well as the disproportion of transportation, speed and costs, as compared to the past.
- The lack of awareness the year's seasonal cycles and the impact of the seasons on the environment.
- No experience in performing a whole line of production, for example the preparation of soil, sowing, growing and harvesting cultivated plants, and the threshing and milling of the seed-crops.
- The problem of a growing difference between the urban and the rural situation in the sense that although the urban situation is our future, the rural situation is being thought of as the environment.

THE LEJRE-CENTRE'S ATTEMPT TO SOLVE SOME OF THE PROBLEMS.

The 'Historical-Archaeological Research Centre' was instituted in 1964 after six years of preparatory work.

In 1967 it became clear that involvement with only imitative experiments would become an economic 'blind street' and a school service was developed. Besides the research and education, a program for summer visitors was carried through.

This three-fold activity became a very fertile situation which created a great insight into the modern attitude towards ethnology (whether prehistoric or historic).

In 1974 the international relations began to play a large role in the planning of the Centre's future.

This year (1976) a 5-year 'perspective plan' was adapted.

One of the main ideas of this plan is to deepen the relationship between relevant social problems of the present and near

future, and environmental interpretation.

If so, the Centre must pioneer in seeking solutions to the weaknesses of the ethnological approach to environmental interpretation.

It is a matter of quality and quantity.

The quality of the ethnological approach depends upon how far the conclusions and interpretations of various scientific disciplines are incorporated into the Centre's work, School Service, Visitors Service and production of media such as books, audio-visual programmes, and demonstrations for the general public. Without such 'anchor-points' the whole project would turn into a 'Disneyland business'.

Therefore the Centre:

- Co-operates with specialists, museums and institutions as consultants in the fields of ethnology, archaeology and natural sciences,
- performs 'imitative experiments' through its own trained staff, thus trying to extend the knowledge of technology.

But the 'demand of quality' also depends in the Centre's ever present desire to popularize the results through personal and honest interpretations.

Here 1) the direct meeting between the public and the specialists 'in the field', as well as 2) the A-V shows have been of great success.

The Centre stands in front of an interior problem, the education and training of its own staff. The difficult fight to survive economically has postponed this important matter. Nowhere else can the staff-members expect to be trained for the Centre is to the moment, the only one of its kind in the world.

The quantity of the ethnological approach through 'historical workshops' is not just a matter of multiplying the number of 'historical workshops' (now large workshops in Denmark number more than ten).

A 'historical workshop' is not a filmshow to be rerun over and over again.

It is a social event between: instructors, teachers and students.

One day a number of students from a strictly urban setting will be at work, the next a group of students from a rural area. One day a class of well prepared, rather "disciplined" students will have difficulties running the activities, the next, a creative class of ill prepared, and "un- disciplined " youngsters can create a situation of value even without immediate feedback or recognition.

The running of a 'historical workshop' - whether the ethnological basis is Iron-Age, 19th Century or present-day life in a developed area, (as the African Village) - is first and foremost dependent on the pedagogical skill and training of the leader and assistants and his acceptance by a group of students as a friend.

A very large number of primary and secondary school teachers have been trained in pre-industrial technology (a total of approx. 1,200 teachers in history, geology, biology, and crafts since 1967).

But long term training courses in the above mentioned skills have not yet been fully enacted. This will be considered in the future. The training has, to some degree, been offered to international participants and in the future this could be developed further.

We believe, that most of the problems listed could be solved through the approach of regional ethnology based on 'historical workshops' since:

- Personal participation outdates the 'TV-syndrome' - facts are created and thus 'owned' by each individual personally, hence accepted and highly appreciated.
- There are direct experiences with basic environmental elements: soils, plants, animals, materials, constructions, tools.
- Large scale mechanization and use of electric and automatic devices is replaced by a direct 'person-tool-material-result' relationship.
- The 'historical workshop' site is anything else but an industrialized recreational area.
(The Lejre-Centre not being the best example as it functions today with 70,000 visitors each summer).
- The 'transmission of energy' and the 'capital of knowledge and technology' as studied by 'cultural ecology' is experienced by gathering raw material from the vicinity of the workshop.
- A total number of factors, the influence of the seasons, and the ecology of plants and animals substitutes for highly specialized knowledge during the workshop.
- The 'historical workshop' encourages the co-operation of various teaching subjects, such as: history - biology - crafts.
- The attained personal insight into a given ethnological problem - e.g. house construction - develops a sound criticism towards the conclusions of the experts.
As the Centre trains students in analysing and 'reading' landscape or townscape, this criticism also covers the

environmental planning by experts.

- Direct practical skills are taught, especially in various subjects of crafts: weaving, woodwork, metalwork, pottery and so on.

The Centre still stands in an uncertain position concerning the application of the 'historical workshop' to a strictly urban setting, and towards urbanism at all. We think, that the future here lies in workshops based on subjects as more specialized workmanship (crafts in proto-industrialized towns) and manufacturing and industry (at the turn of the century). We believe that this will bring about environmental interpretation in an urban setting, especially with regard to man-made structures and work-processes not shown in a rural-orientated workshop.

It is our hope, that financial support in the future shall help us reach these goals.

THE ETHNOLOGICAL APPROACH - THREE EXAMPLES

In Denmark a system of nature-parks numbering about 30 is planned. How do we interpret these parks ?

One of the first to be established is the TYSTRUP-BAVELSE nature park in West-Zealand south of SORØ.

The landscape is varied, the main categories of elements are 1) the river SUSÅ with the double lake of TYSTRUP and BAVELSE with fishing of fresh-water fish, 2) the moraine hills, among other 'plateau-hills', the former bottom of glacial 'ice-dammed' lakes, now standing free as clay-plateaus well suited for the making of redbricks, for example the LINDE-BJERG-complex, and 3) a vast forest district, belonging to a number of estates, covering large part of the area and giving way to charcoal-burning not so long ago.

An example is the earlier LORUP SKOV charcoal industry.

A working multiscreen show of colour-slides will be presented at the STUDY CONFERENCE.

The presentation will be: 1) Chronology of the environment, 2) the ecological approach, and 3) the ethnological approach, to facilitate the interpretation of the nature park and its vicinity, a region of some 400 square kilometres. The programme is being arranged in close co-operation between the HAR-Centre, Lejre, and the Danish Ministry of Environment.

Beside the intended evaluation of the compiled working series of colour-slides for the future Visitors Centre during the AV-day of the Conference by the participants, three sites here are chosen to give concrete examples of the role of regional ethnology in environmental interpretation and education.

They are concerned with:

1. Fishing in lake TYSTRUP,
2. Redbrick factory at LINDEBJERG,
3. Charcoal burning at LORUP wood.

The presentation aims at students in the Danish 'folk-school' at the age-level of 14 to 17 year.

It is based on the current principles designed for the Centre's future: School Service and possible historical workshop-activities.

(THE THREE EXAMPLES WILL BE DEMONSTRATED TO THE CONFERENCE BY COLOUR-SLIDES).

EXAMPLE ONE: FISHING

The basic ethnological objects are 1) a bow-net for catching the fish, 2) the following fish: (Primary) the Eel (*Anquilla anquilla*), secondary) the Bream (*Abramis brama*), the Perch

(*Perca fluviatilis*) and the Pike (*Esox lucius*).

The bow-net would be a typical display object in a local museum, and the construction is subject to local variation and therefore a good example of variations studied by regional ethnology. The variations stemming from the adaptation to a local environment and local historical traditions, as well as culture-contact with other regions.

The species of fish caught in the lake would be displayed at an aquarium. Only a few places in Denmark would both objects be presented to the visitors in a context simulating the reality of the environment: the live fish and fish which could be represented by a photograph or stuffed specimen together with the artifacts.

Today in the lake TYSTRUP one family makes a living from catching the eel and selling it primarily to a local restaurant, the FISKERHUSET (the 'Fishing-house').

You will find the LIVING PLACE (house, netmending place, the pier for landing the fish).

Three BOATS of various sizes are anchored under the green shade of the 'KELLERØD' wood at a small pier.

The main EQUIPMENT is a number of fresh-water eel-dams with bow-nets distributed along the lake-coast.

The sites for the construction of the eel-dams are carefully chosen according to the location of the best CATCHING-PLACES, which, again, are dependent on the plant-zone along the coast, the present geomorphology of the coastline and the lake bottom.

The arrangement and construction of LIVING PLACE, the BOATS, the EQUIPMENT and the CATCHING PLACES belong to the 'capital of technology' and the 'capital of knowledge' at the fishermen's disposal. The fish represent a source of energy to the fishermen, and the catching is the 'transmission of energy'

from nature to the society. In such a terminology CULTURAL ECOLOGY as an approach to REGIONAL ETHNOLOGY would describe the activity.

Up through time technology and knowledge have changed as well as the importance of the source of energy, as such, to the society.

The bow-net of the 9,000-6,000 years old Mesolithic hunters does not resemble the present net, made as it once was of willow-twigs and strings of lime-bast. But only a few generations ago the middle-Stone-Age bow net would still have been in use.

Also fishing rights have changed. Previously owned by the monastery of Sorø it is now owned, in part, by the estates of NAESBYHOLM, historically changing the relationship between user and owner. Also sales to the present, well visited restaurants and the smaller sale to local people has changed the economic basis of the fishing.

Up to this point the description has been mainly along the lines of museum displays, planchet exhibitions and what would be written in a local guide.

If not especially interested, many young students would have abandoned their interest in the bow-net and the fish long ago! Therefore we introduce a 'HISTORICAL WORKSHOP'-situation.

The easiest would be to take part in emptying an eel-dam. Better still would be constructing an eel-dam and a bow-net, waiting for a catch, emptying the catching devices and selling the catch of today's prices.

Then a number of questions would immediately arise, most of which are entirely concerned with ECOLOGY:

- what are the names of the various fish we caught,

- their number, origin, feeding and the relative balance of various species,
- which large birds steal the fish from the nets (the Cormorant, *Phalacrocorax Carbo*),
- the names and appearance of plants in the plant-zone along the coast, where the young Bream would feed, or which would be an obstacle to the establishment of the eel-dam, and
- the present state of the water (polluted or not, the present rate of atrophy).

The knowledge may be obtained through an interview with a fisherman, and/or by consulting experts, books and the results from simpler analysis.

The total information would then be presented as an exhibition or a colour-slide show at the home school.

Later a 'feed-back' report could be given to the authorities as well as the fisherman, all in response to the future state of fishing, the lake, and the fauna and flora of the lake.

Suggestions on unregulated developments, as well as the need for regulations could be made.

EXAMPLE TWO: REDBRICK-BURNING

Basic objects: 1) a redbrick, 2) a lump of clay.

Both typical of an exhibition as one may know.

The regional distribution of redbrick factories is clearly dependent on a very special element in the glacial formation of the present landscape: the ICE-DAMMED (or partly ice-dammed) lakes with silted clay deposited in 'varis', later left as a plain or a 'plateau-hill'. (In some cases tertiary clay deposits forms a third basis of redbrick industry).

Local variations in the constructions are no longer found, but the regional distribution of the industry to a local site would, until recently, influence the social and economic life of an area.

Around the factory you find the LIVING PLACES of the workers. The FACTORY itself and the large CLAY PITS dominate the landscape.

The EQUIPMENT today is a mixture of industrial machinery, digging-machines, trucks, as well as hand-tools of earlier days.

The STORING AREA with stacks of bricks, drainage tubes and heaps of refuse surrounds the various drying barns, the oven-house and houses for the machinery.

ROADS and RAILS marks out the connection with further places of distribution (Railroad station, public roads), and the weight of the product.

The BUILDINGS OF THE REGION often are influenced by the use of redbricks in comparison to local cross-timbering and straw roof thatching.

The interpretation is through cultural geography.

Regional ethnology would be concerned with the influence of redbricks on the local building style, the impact of settling families of bricklayers on this, the life and traditions of labourers working at the factory and the impact on landscape and cultivation made possible by the use of drainage-tubes. Students often overlook such social factors as well as many factors related to the production of redbricks. They are simply piled in hundreds and thousands, and the landscape looks as it always has looked. Why then bother about the matters behind?

Now we introduce two elements of 'historical workshop'-situations.

- 1) The digging, treating, moulding, drying and burning of one or a few redbricks.
- 2) The construction of a drainage in a wet area a score of metres long.

A number of questions will be asked during the rather heavy work (at which the students seldom refuse to take part) about:

- the varieties of clays, as well as which one is the best suited (geology, soils),
- why clays are deposited here, and not elsewhere ~~geomorphology~~,
- what happens to soils, plants and animals when wet-lands are drained,
- the enormous raise in production from hand-made to industrially made redbricks, and
- the chemistry behind red, yellow and blue or black bricks.

As usual the students must form their own notion of how to present the material from interviews, books, analysis and site visits. and

which ~~medium~~ they prefer to use in the presentation of the environment to people concerned with the environment.

Future prospects: an old, little used factory might - or should be - developed into a large, modern industry for other products, for instance modern construction elements. The impact on landscape: plateau-hills being totally removed or pits carefully restored when no longer in use. Before - or after the workshop-activities - the history of redbrick-making would be touched upon - simply by sheer questioning.

A neighbouring estate or ruined medieval castle or stronghold was not based upon machine-powered brick-industry, but small

hand-operated units of redbrick-making sites; hence irregular shapes and surfaces of the old bricks. Thus historic chronology, that is the time-span of regional change, comes into the scope. The change in the environment becomes more clear to the students.

EXAMPLE THREE: CHARCOAL-BURNING

Basic objects: 1) A piece of charcoal, 2) a piece of oak wood. As with the redbrick fabrication, the regional manufacturing of charcoal is based on large woods.

Woodland, regrown since the destruction of the Danish 'lime-oak' forest 6,000 years ago by the new Stone-Age 'slash-and-burn'-farmers, these large forests stand on land, which was difficult to cultivate in the Middle-Ages (600 to 900 years ago).

Deserted villages and the establishment of large estates also preserved much forest land. Then - behind the charcoal-burning as such - are a number of other social, cultural and technical reasons. Behind this we again see the soils and geomorphology of the landscape as left by the great glaciers of the latest Ice-Age.

Charcoal-burning has practically no meaning in the modern industrial society.

Why study this at all?

In an energy crisis resources for fuel would immediately raise in price. Wood, bog-peat and brown coal (and charcoal) would play a very small, but still useful, role in the emergency energy supply.

This would have a great influence on our rural environment - for example the forests.

But very few students from urban settings realize, that a forest could ever be changed?

By use of simple technology ancient man completely devastated the woodland in whole regions of Denmark.

To obtain charcoal and tar for iron-melting, forging, glass-making, house- and shipbuilding and the maintenance of these structures.

The charcoal-burners used to run seasonally (as the earlier redbrick-makers). Forest rights put social and economic limits to this industry.

The CHARCOAL-MILERS were constructed where the trees could be cut down.

The EQUIPMENT was simple (saw, felling-axe, spade, shovel, bags or baskets).

Due to the light weight of the charcoal, the TRANSPORTATION and distribution of it demanded nothing but trails for horse-drawn wagons.

The best RAW MATERIAL was oak. But all varieties of trees could be used, determining the quality of the charcoal.

Very few museums and books deal with charcoal-burning as an industry. Although once charcoal was one of the ingredients of gunpowder!

A 'historical workshop'-activity might easily be arranged: To split an old trunk, build a pile of fire-wood, cover the pile with earth and grass-turves in order to make a charcoal-miler, and to set it afire.

Depending on the size, it takes anywhere from four to twenty-four hours (or more) to finish the burning. The four hours of a satisfactory workshop-test demand a small capital of knowledge:

- the chemical/physical explanations behind the transformation of wood to charcoal (reduced firing),

- the value of charcoal as a fuel compared to ordinary fire-wood (calories per kilogrammes),
- why oak-trees look alike, why they grow where they do, the growing season, age size,
- the sods and soils best used as the cover of a 'miler', and
- the environmental consequences of stripping whole areas of forest.

Even a vague understanding of why the CHARCOAL-BURNERS became a social minority, and why they often became the subjects of mysterious tales, might be achieved.

The charcoal-burners could have been the 'spear-head' of the cultivation of forest land, hence giving the push to a complete change of the rural environment just as the energy shortage in Denmark during the second world war changed the environmental elements: peat-bogs, woods and brown-coal land.

Imitative Experiments and Environmental Interpretation.

Unfortunately Mr. John Coles is not able to participate in the Study Conference. Knowing his field, the comparative study of the imitative experiment or as his book says, "archaeology by experiment" (Archaeology by Experiment, John Coles, London 1973), it is indeed a shame.

However, he has sent us a resumé of the paper, he had prepared for this conference.

I feel that his paper right now removes a burden from me, namely to go into a further description of the 'imitative experiment'.

Recently the communication of results and conclusions from a world wide forum of experimenters (for anyone concerned with this approach to the study of man's history) has taken a great step forward. In May 1976 in St. Louis, Mo., U.S.A., a group of experimenters put forward a variety of experimental programmes. It was on this occasion that the decision was taken to plan an International Ongoing Catalogue of Experiments in Archaeology (and ethnology).

One of the participants in St. Louis was Peter Reynolds. As he will be giving us a detailed insight into his results and experiences at the Butser Hill Ancient Farm Project in England, he too removes the task of demonstrating the scientific implications of experimental research.

What remains then?

As you have heard this morning the Historical-Archaeological Research Centre is fundamentally based on research and development in the broad sense. I do hope that the printed material on the Centre's various perspectives and activities

has given you some understanding of this pioneering project. This morning a link between the Netherland Study Conference in 1975 and our study conference was established. The present and future roles were touched upon and so were the four working areas of the Centre: the research, the school service, the visitors and the adult courses.

It's now obvious, that it is the research and developmental activities which are the most important for background to any other service or public presentation, whether at the Centre or outside.

Due to the many financially meagre years, the 'non-profit activities' have had a bad time at the Centre. Survival means money, and this entails a vicious cycle of ups and downs which undermines the valuable task of the Centre, as expressed in 'The Perspective Plan' as the goal of the Centre.

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The research and development at the Danish experimental Centre is divided into a number of permanent and semipermanent workshops. You will meet the leaders, and staff of these workshops in the coming two days.

Eleven years ago during the Centre's first summer campaign it became clear, that the workshop would be the forum for outside experts (ethnologists, archaeologists, technologists) to meet the trained craftsmen and -women permanently at work at the Lejre-Centre.

A workshop is the best frame for the inevitable team-work situations which create worthwhile experimental results. Since then it has been our firm conviction that this model is the best.

And as the Centre's part of 'the deal' - the frames and the staff of craftsmen and skilled people were soon established, but the outside factor for a very long time hesitated to accept the role of an experimental Centre. Well - we were young, some of us still students, - and we were in a constant fight for small grants. But a broad interest in the future goal was a tremendous help to us.

Now this is history.

Just as the present can be traced to the past, so can the public's current acceptance of interpretation be traced to the support lent to the Centre by the areas of scientific study which strengthen the public's understanding of interpretation. Highly specialized work is beneficial to the Centre only when it links into the pattern of research for education and interpretation. Good results can be seen from the teamwork of the varied specialized workshops.

I intend to describe in brief a few of these examples and then leave it to Mr. Reynolds to give further examples from his Butser Ancient Farm Project. My examples are included in the Structure Plan and colour slides are used to visualize the activities.

The farming department since 1966 has co-operated with the zoologist of the University of Copenhagen, the 'Department of Quartarian Zoology', especially cand.scient. Tove Hatting. Studies have been made concerning the breeds of old Gotland sheep, some breeds of ancient Scandinavian cattle, and Faroean sheep. The Gotland sheep have given the possibility of studying milieu, age, feeding, diseases, outlook (changing

colour of the wool), when compared with the collected skeleton material. The experimental results again are used for comparative studies on bones of husbandry animals - here sheep - recovered from Neolithic to Medieval sites.

The farming department also at various occasions has studied agricultural implements of prehistory.

Especially the tilling implement, the ARD, has been under close study. Both traces of wear in the experimental copies and traces of the tilling process as plough-marks in the subsoil are compared to recovered material from prehistoric sites. Various limitations on the use, the technical arrangements, and problems of tilling various soils and fallowland areas have been studied.

Sickles, shorthanded scythes, spades, leaf-knives, removal of stones and stubble, slash-and-burn technique, the predominant movements of pigs, cattle and sheep in the landscape, as well as the various forms of alterings and destructions of plant systems and soils and the environment as such, has now and then - but not yet systematically - been studied on short term trials.

The ard studies were fortunately guided and critisized by Professor Axel Steenberg, Professor P.V. Glob and Gudrund and Viggo Nielsen, probably the most competent group of specialists in prehistoric agriculture in Denmark.

The audio-visual workshop long before 1970 began collecting colour-slide material for interpretive programmes, as well as experimenting with the arrangement of these.

In 1969 the first light-and-sound show was set up in an Iron-Age house-reconstruction.

A variety of guide-pamphlets, folders, small books, signs and drawings were already in use then.

Since 1970 a rapid development has taken place, due to Mr. Ole Malling's work.

This side of the work will be far better demonstrated during A/V-session on Friday.

It is important to bear in mind, that photos, slides and drawings based on the total activities of the Centre during roughly 10 years are now represented in all school-books on Danish prehistory, and many books and films on the history of Denmark or Scandinavia now contain illustrations and descriptions originated at the Centre.

As a matter of fact the photos and slides now carry the fairly large responsibility for visual insight into the prehistory taught to most of the younger generation of the Danish people.

A very serious task to undertake if we consider the financial limitations on further research based on imitative experiments at the Centre.

The weaving workshop was the very first to be planned in 1965 by Mrs. Mette-Lise Rössing. Later it was carried on by Mrs. Ninna Rathje.

She did some of the most comprehensive experimental studies of the techniques and craft behind ancient weaving based on the 'Upright Warpweighted Loom', as well as a number of minor techniques behind the unique Danish treasures of prehistoric and medieval garments.

Based mainly on her own craftsmanship, she was helped by assistants with a Bronze-Age garment, of the 'Egtved-Girl', the Iron-Age garments of 'Thorsbjerg', 'Huldre-Mose' and

'Laune', and the Medieval garments of 'Herjolfsnæs' (Greenland) and the 'Bocksten Peat-bog' (Sweden) objects of renowned studies which led to some revisions of details.

During the experiments contacts has been with experts Martha Hoffmann (Norway) and Margrethe Hald (Denmark) as well as with the first and second department of the Danish National Museum. Mrs. Rössing is now in charge of the workshop and the new research-programmes which have been set up.

The workshop of clay and fire techniques also has been functioning for more than ten years. The work has been and still is led by the retired civil engineer Arne Bjørn, who is renown for his research work on prehistoric pottery kiln types and types of pits and kilns for various firing purposes. Before 1966 the construction and use of most of the now known pits and kilns were not properly known. As a matter of fact a number of kiln types were not at all recognized previously. The specialized constructions of the kilns for firing pottery and the various operations necessary to control the firing, the use of fire-wood, peat-turves, damp leaves, oil, grease and so on, are well known through hundreds and hundreds of firings. Mr. Arne Bjørn has worked closely with archaeologists and technicians from various European countries, sometimes even practicing team-work at the workshop.

Forming clay vessels for firing experiments is also important. Here the lack of close co-operation with geologists and laboratories for analysis of minerals and samples has been a disadvantage.

But due to the assistance Mr. John White (American Indian ethnologist) and - long before - Mrs. Maren Hansen (one of the last makers of the old Jutland Black Pottery), and

as an example of the importance of ethnology in 'imitative experiments', the study of formation of various prehistoric types of pottery has had worthwhile progress, led by Mrs. Grethe Andersen.

Especially the transition from coiling up the body of the pots to both coiling and blating with a mallet has been a fundamental breakthrough with respect to the educational use of the results.

The metal workshop run by the conservator and blacksmith Kaj Ørfjell has made experiments with iron extraction and primitive forging devices such as bellows, forging pits and anvils. Far better planned and more extensive experimental studies have been carried through elsewhere, in Denmark, Sweden, Germany, Czechoslovakia and England. The real advantage hitherto has been the production of tools for our woodworking-experiments and the building team (the Iron-Age house-reconstruction). In this respect, as well as the development of adult courses and school service-activities in metal work, the metal workshop is highly important.

Beside this I would like to stress another aspect: the ongoing effort to preserve the rapidly vanishing crafts of the blacksmiths. If once lost, it will be very, very difficult to recreate this fundamental craft!

The Smallholder's House represents . one of the most complex long term experiments. Beside trials where proper technical information is lacking, hundred year old written folk-traditions, memoirs and descriptions are used. This functions as an experiment in the further ethnological recordings of old traditions still remembered by the older generations today. A functioning milieu awakens the memory

and criticism of old informants. Small details, which are remembered when the informants perceive the milieu by hearing, smelling, and touching the implements and structures.

This workshop is lead by Mrs. Anna Margrethe Lægaard and Mr. Vagn Jacobsen, both born and raised in the rural Danish environment.

They both carry on techniques and knowledge of 19th Century traditions in the Centre's research and in the educational use of workshop-techniques of that century.

The Prehistoric Village is the first complex experimental site set up in the world aiming at the study of a fundamental time period in the creation of the Scandinavian nations from 500 B.C. to the Viking Age: the heavy building up of the Viking Age of new settlements and large scale construction of ships, houses, bridges and defense works.

The North European long-houses have been studied for fifteen years. I personally began in 1967. Later imitative experiments to control the hypothesis of the various details in the construction and use of this house type have been performed. Among others, the burning of houses and excavations of the sites to achieve a direct comparison between original and copied burned sites. Also studies of the micro-climate, draft and heat conditions during winter time have been made.

The co-operation with 'prehistoric families' eg. families who volunteer to live for a time in the houses, has produced a large number of observations on a variety of details. These, and other, activities has created our ideas for the school service, as well as a still growing insight into the value of the Cultural Ecology approach for a better understanding of the factors involved in man's existence in natural environment, and uses as well as abuses of the environment.

The rather weak co-operation with many archaeologists, as well as ethnologists studying the history of housing and building-construction, is explained by:

- The scanty publications on our results, and
- The Centre is a step ahead of site excavations.

This is now changing to a better situation.

The Building Team is better understood if we think of it as an ad hoc group for imitative experiments in wood working. An example is the reproduction of a Viking Age two wheeled wagon. This was done in close co-operation with the Swedish archaeologist Cajsa Lund and Gustafsson and the Norwegian civil Engineer Magnus Bauer-Nielsen. The study aimed at better knowledge of the functioning of:

- harnessing before the Middle Age,
- the wagon and land transport, and
- a sounding device - the rattle made of iron-rings.

Another example is the reconstruction of an Iron-Age saddle, a type found in Jönköping, Sweden, and often depicted on stones and textiles, dating to 600 A.D.

In co-operation with the archaeologist Søren Krogn a number of trials on horsemanship were performed, bringing further contributions to our knowledge of the East European inspired equestrian equipment before and during the Viking Age.

And last, an example now under planning is the possible close study of carpentry and wood-working tools discovered by marks in extremely well preserved wood from the Tryggevælde River Valley, East Zealand, used as a road-bridge about 600 A.D.

There is a difference between the permanent experimental workshops, and the ad hoc-experiments.

The farmer brings us obviously much closer to the understanding of environmental factors.

The latter goes deeper into one single technology of the transmission of energy from nature.

Thus the establishment of historical workshop activities is as an important link with the ethnological approach to environmental interpretation and education and is strengthened by the permanent workshop experiments.

But if we bear in mind the fine experimental work done by the Moesgård experimental station in Aarhus, Jutland, (on Viking-Age housing and technology), and the results of experiments with copies of Viking ships and boats promoted by the 'Skibs-historisk Laboratorium' at the Vikingships Hall, Roskilde, we shall see, that in the end all experimental activity brings us a long way forward in understanding the past, which never could be reached at the writing table, through books, or in the excavation-sites or through ethnological research alone.

TIME-SPACE RELATIONSHIPS IN SEVERAL ECOLOGICAL ZONES OF EUROPE. (CHRONOLOGY)

