

## Thorne & Hatfield Moors Oral History Project

**Interview with: Nicki Whitehouse**

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**Interviewer: Lynne Fox**

*This is Lynne Fox for the Thorne and Hatfield Moors Oral History Project it is the 8<sup>th</sup> December 2006 and I'm talking this morning to Nicki Whitehouse. Morning.*

Morning.

*I wonder if I could begin by, if you could begin by telling me a short description of what it is that you actually do.*

Yes, certainly, what I do is I study remains of fossil insects, primarily beetles which are preserved within the peats of both Thorne and Hatfield Moors. These are not the only sites that I study but they've certainly been the main focus of my research for the last twelve years or so. Basically what happens is that any water logged deposit, particularly peats, will preserve any biological material which was once living on the bog and as the bog develops anything that was living in the bog will then become encapsulated within the deposit and as the bog develops you basically get a history through the bog itself of the different plants and animals that used to live on it and basically my research is fundamentally about looking at how the bog itself has developed and changed over time.

As I mentioned, my particular speciality is looking at the fossil insect remains and basically insects are found in any type of fresh water and terrestrial habitat and the wonderful thing about looking at insects and especially beetles is that it's possible to identify them down to species level even when they're in a fragmentary state and because they're ecologically very specific in terms of their specific requirements it is then possible to use them as a proxy for environmental reconstruction. What do I mean by proxy, what I mean is it's used as a way of reconstructing what a landscape may have looked like from it's particular biological remains.

So in the case of Thorne and Hatfield I've been looking at the development of the fauna itself but also using the fauna as a way to study how the moors developed, how they began, how they changed over time, how they were impacted by human beings, how sea level change, climate change have an impact on them and effectively why they look the way they do today as a result of those different processes. So the kind of research that I do is not just about looking at the biota itself, although that in itself is also very interesting, but it's all about looking, using these environmental remains as a way to reconstruct the whole nature of the landscape.

*So when, when you say that a bog develops...*

Yes.

*It has different surfaces?*

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Yes, that's correct.

*How does that happen? So the surface that's there now has not always been the surface?*

No, basically what happens with a bog is as it's developing it encapsulates its own history, it's a three dimensional view of the landscape. So rather than an agricultural soil for instance everything will degrade in situ. With a bog what happens is the bog develops and moss and other remains sort of build up one upon the other until you get this mass of layers, so for instance we know from historic records that Thorne and Hatfield Moors used to have depths of peat going ten, twelve metres down, so what you have effectively in those ten, twelve metres is a record of how that bog developed and the wider environment. So you have a wonderful environmental history on how those sites developed and that's what's so unique about raised mires is that they can encapsulate their whole history, unlike many other ecosystems which, I mean, some will do that but many won't and so they're incredibly valuable for studying environmental change.

So if we dig through it we can actually stand on a layer that is five thousand years old and there are very few environments where you can actually do that. I mean, sadly, much of the bog, because it has been cut over, there is nowhere that you would have this kind of depth of peat left over, so for instance the ten or twelve metres of peat that I mentioned that would have been in the nineteenth century. Today we're lucky if you get more than a couple of metres, maybe two or three metres of peat in some places.

*Can we tell, can we tell when the peat started to form?*

Yes, we can do that quite easily by two ways, one is by radio carbon dating the actual peat itself at the bottom of each bog and to do that we just take either a small baulk sample of the peat or perhaps extract some of the plant remains and these are dated using radio carbon dating. The other way we can also look at the development of the peat is also by studying the remains of the wood which is preserved both underneath Thorne Moors and Hatfield Moors and the wood can be dendrochronologically dated which means...

*Could you explain that?*

Yeah, dendrochronology is basically the study of tree rings and it allows you to actually calendrically date pieces of wood, as long as the piece of wood have enough tree rings on them, you need to, usually about fifty tree rings on them. They usually have to be oak or pine in species, other species can't really be dated, terribly easily and you also need sufficient quantities of bits of wood to be able to reconstruct what is a local chronology. So the odd piece of wood is not gonna be sufficient to reconstruct a dendrochronological record, but we're lucky at both Thorne and Hatfield that there are such extensive remains of wood that it has been possible to actually date these accurately using tree rings and the way this works is basically, what people have done is that they have worked backwards in time.

So they have used modern trees, taken cores from these and counting, counted their rings and because you used a modern tree you know when that tree is still living and you work backwards in time, then you can take cores from older trees and correlate them against the modern trees and then you keep on pushing your chronology back by using timbers from medieval building structures for instance, and then further back using material from archaeological deposits and then even further back, material from

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raised bogs for instance, timber track ways and in fact I work in one of the internationally renowned centres for dendrochronology which is the Paleoecology Centre at Queens University Belfast and there they pioneered a lot of dendrochronology associated with Irish archaeology and Irish raised bogs and they trained a number of people who've been associated with British dendrochronology.

So, to go back to Thorne and Hatfield, basically what happened is that the research was mainly undertaken by Doctor Gretel Boswijk who is now based at the University of Auckland in New Zealand, building upon previous work which was carried out mainly by Jennifer Hillum at the University of Sheffield and because there was an existing data set and because the data set from Thorne and Hatfield Moors can be fitted into these wider dendrochronology it has been possible to actually date the timbers and perhaps uniquely Thorne and Hatfield are the first sites to have their pine chronology dated accurately using dendrochronology and as a result of that work it has been possible to date other sites.

I should also add that the dendrochronological record is incredibly important for two reasons, one is that all wood which is encapsulated within the dendrochronological record has been used to help refine radio carbon dating. Most radio carbon dates are not, any radio carbon date which is returned back from the lab is not a calendrical date it is a date which is basically before present, or BP. If you want to then convert that radio carbon date into a calendrical date and take into consideration the changes in the atmosphere of radio carbon then you need to be able to compare your radio carbon date with an actual, with a calibration curve and the calibration curve is generated from the dendrochronological record. So any radio carbon date which is generated for any site in the British Isles or within northern Europe is dated by reference to the calibration curve which is generated from the dendrochronological record. So it has very wide applications.

Beyond that, because each tree puts down it's layers every year, basically what you have is encapsulated within each tree a record of environmental change which is annual, of annual resolution, and that means that if we look at the whole dendrochronological record we can start to look at environmental and climate change over the, over the period of time which is represented by the dendrochronological record.

*How will the tree demonstrate that?*

Well the tree is living on the bog and it is inevitably going to be responding to surface wetnesses within the bog and any climate changes which are affecting it. So there are two components to the tree's response, one is edaphic, which is basically a response to the local environment in which it's living in, in this particular case a bog. It's also responding to wider atmospheric changes, such as climate change, such as changes to precipitation, such as temperature changes. So, within each tree ring you can then start to study those particular changes. Now, there's been quite a lot of work done on this but it's still, this kind of research is still very much at the cutting edge and is being refined, but I think it's safe to say that the dendrochronological record of Thorne and Hatfield will be of supreme use to our study of the fluctuation of past climate change and of course we all know that climate change at the moment is a pertinent issue and the only way we can try to understand climate change is by looking at how climate has been affected in the past. So we use the past to help us guide through our understanding of climate and also the kind of responses, the biological responses that we might expect those to have. So they're of tremendous use as an archive to our understanding both of the past but also of the future.

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*We normally associate Thorne and Hatfield Moors with peat.*

Yes.

*And the bog and the environment, we don't really necessarily associate it with mature pine trees and mature oak trees, how did that happen?*

Well, I think that's, basically what you have preserved at the bottom of the bog is what myself and various other colleagues have called a mire woodland, now these are actually very unusual now in the British Isles. They're ecosystems which are, you can still go and visit in places like Fen Escandia.

*Where's that?*

Sweden, Finland, and they tend to be dominated by pine, oak, birch, perhaps a little bit of alder, perhaps a little bit of hazel. Those kind of woodlands are no longer extant you cannot see those in the British landscape anymore. Largely, because as I say, a lot of mire woodlands have disappeared, in part that is due to the fact that eventually when a bog develops it becomes too wet to actually allow the encouragement of trees onto the, upon the surface, but there are periods of time when a bog will actually dry out sufficiently to allow trees to invade. Now there's been a, a sort of, a view by many nature conservationists that having trees on bogs is a bad idea and certainly from the perspective of maintaining a raised mire assemblage, a plant assemblage and so on, it may be viewed that having trees on a bog would be a bad idea. But perhaps what a lot of nature conservationists forget and perhaps this is what somebody with my discipline from effectively a paleoenvironmental discipline has is that these systems are constantly evolving and changing. So if you look at both Thorne and Hatfield over time they're not static, and nor should they be conserved as static landscapes, they're constantly evolving and changing and some periods of time you will have had trees growing on them and other periods of time they would have been far wetter and it's that complex interplay between the different, the different, the drying and the wetting, the invasion of the bog surface of the trees and perhaps a movement off the bog surface of the trees, which makes the assemblage that we see today unique.

So everything that has occurred on the moors over the last four and a half thousand years is what has created what we see today. So what you see today is not a snap shot of something that has been created in the last, you know, hundred years, it's something which has been created over four thousand, four and a half thousand years of environmental history and I think this is something people tend to forget and for that reason it is impossible to recreate it. Because it is the sum of all those, of those processes and that is, you know, you'd have to wait four and a half thousand years for similar things for it to be recreated. So what you're going to recreate is always going to be very different and I think one has to accept that.

To go back to your question about why the trees are preserved, it's basically because as the bog developed the woodland that was growing before the bog, actually becomes encapsulated as the bog is starting to grow. So the bog itself must have started to develop relatively rapidly because otherwise you would not get the trees being preserved in the first place and if you look, if you look at the bog rather like a layer cake you'll see that there have been periods of time when there were no trees and periods of time when there were trees. Certainly the best preserved material tends to be at the base and I think that's what we've called the pre-mire woodland. So it's basically representing either just before mire development or just in the early stages of mire development. So you've got quite an acidic

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environment. A few ombrotrophic species sort of acid loving species developing, but it's still basically a mire woodland and it's preserved because the mire then starts to develop and it encompasses it. So you get this wonderful record of an ecosystem which, you know, survived on these sites about four and a half thousand years ago.

*Thorne and Hatfield Moors form part of the Humberhead Levels.*

Yeah.

*Could you tell, that, are they, are they distinct and defined in environmental terms or are they part of a large, a larger area that's fairly similar?*

They're part of a much larger area but whether I would call it similar I would, I would probably not agree with that concept. I think they're part of a mosaic of an incredible landscape, a wetland landscape of raised mires, flood plains, heathland areas, fen areas. So it would have been a very complex area and the bogs themselves would have been part of a much wider complex of raised mires. I mean, today we see them as separate sites but in fact from stratigraphic evidence it's fairly clear that they used to be part of the same complex, although there are river systems interweaving between them. So they were, they were connected although they still had their own particular characteristics but they're also part of a much wider area of flood plains and river systems that were sometimes possibly multiple channelled systems that split off in different directions forming meres, these are, these sort of lakes that sometimes can be quite temporary in nature or may expand and contract with the different seasons.

So you have this wonderful mosaic landscape and I always remember reading a description of this landscape which Colin Howes gave in a paper that he wrote back in about 2000 and the way he describes it, as he calls it a wonderful everglade like landscape. Now, on one level that might be seen as being slightly, a little bit over the top in terms of a description but on another level I think it really encapsulates the complexity of the landscape and I think it's fair to say there is no equivalent landscape like this in the British Isles any longer. I think there are places which would have looked like this in the past, but sadly no longer and this is what is so fascinating about this landscape is that when you visit it today it looks rather featureless, it's very flat, there doesn't seem to be an awful lot happening and yet when you start to peel away the environmental layers what is exposed is this incredible wetland landscape with incredible complexity, biologically very rich and which presumably must have supported human life within a range of different types of ecosystems and that's what I find incredibly fascinating about looking at this landscape. On the surface of it, it's, it's rather innocuous and you know, you could almost call it boring from today's perspective but when you peel away everything what it, what remains is something much more interesting and much more complex than landscapes which perhaps are very obviously beautiful, like mountain scapes and so on, their beauty is much more obvious, but here it's, it's beneath the skin, but it's nevertheless very important I think.

*And we talk about Thorne and Hatfield Moors as if it's one blob.*

Yeah.

*Are they similar or are they, are there distinctions?*

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They're very different actually in my view. They, in terms of their structure they're different, I mean, I worked more on Hatfield than I have on Thorne, although I did quite a lot of work on Thorne. If I can start with Hatfield first, the current delineation of Hatfield is of course only a fraction of what it used to be in terms of its extent. What makes Hatfield unique is that you get Lindholme Island in the middle of it, so you get a, it's a moraine island and in fact at the end of the last ice age what would have happened is you get a series of moraines and glacial deposits would have underlain the whole area and you can actually see these glacial deposits exposed in some of the, the sides of the drains on Hatfield. You also get this wonderful dune system beneath Hatfield which is probably dated to the end of the last Ice Age, what is known as the Younger Dryas period, which is the last final cold snap just before the beginning of the current warming of the Holocene.

*Sorry to interrupt you there.*

Yeah.

*We normally associate dunes with sand?*

Yes they are sand.

*We're talking, we're talking about ice?*

No these are sand dunes, there are sand dunes but they're created as a result of, of a periglacial sort of environment. Cold winds and so on moving and shifting sands around. So the ice, the ice sheet certainly by this stage would have been far, far north, in fact the Younger Dryas is also known as the Loch Lomond Stadial, so in Loch Lomond there would have been an ice sheet but further north, there wouldn't have, further south there would not have been. But still you're talking cold environment. It's only during the glacial maximum which it would have been about, between twenty and eighteen thousand years ago that the ice sheet would have extended much further south.

*And would it have reached Hatfield and Thorne?*

Yes it would, in fact, the end moraine is, there's some discussion about the exact location of the end moraine, but it's very close to Hatfield, in fact Wroot is supposedly one of the locations of the end moraine and I'm sure Paul Buckland will be able to advise you further on this, because this is more his area than mine. But certainly yes, the ice sheet would have been very close and over part of the site.

The geology has had an impact on how the two sites differ. So underneath Hatfield you have this wonderful sand dune system, and because of that you have effectively quite an acid environment immediately and quite dry. In contrast underneath Thorne Moors there was the periglacial Lake Humber and that has left clay silts beneath it. So unlike Hatfield with its sand dunes, underneath Thorne Moors you actually have clay and clay of course is, means that it creates a sort of bund between the moor, the peat itself and the underlying water table, so it creates sort of a sealed deposit. So consequently Thorne Moors has always been much wetter than Hatfield and the geology has also had an impact on the types of animals and plants that were living on it.

So on Hatfield, Hatfield has had a much stronger what I would call heath component, so much drier, much sandier types of species. Now in terms of vegetation this is likely to have just made Hatfield

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slightly drier, perhaps with a heavier dominance of things like the heathers but where you really see the difference is in the invertebrates. So you start to get many species that are associated with heathlands, with dry habitats, with sandy habitats on Hatfield, in a way that you don't get on Thorne Moors and it's only really by studying the invertebrate interest that you really start to see these differences, and in fact I think until relatively recently certainly English Nature have a tendency of viewing both sites as more or less the same and in fact a lot of my work has shown very dramatically that that is not the case and also the modern invertebrate work which Peter Skidmore has been involved in. So for instance, if you look at the fossil record and you do some various statistical analyses you can actually see groups of species developing. Groups of species associated with Thorne and groups of species associated with Hatfield and big gaps between them. So fundamentally very, very different sites.

They also developed differently and that also has created their differences. So for instance on Thorne Moors if you look at radio carbon dates associated with the base or peat deposits there are some areas where peat development started earlier than in others. So for instance Rawcliffe Moor and Crowle, Crowle Moor have earlier peat dates to other areas of the moor. So, basically you get wetland development in localised areas and then as the water table gets wetter you start to get other wetland areas developing and eventually they coalesce to form a whole.

Hatfield is rather different, much of the work that I did as part of my PhD suggested that many of the base or peat deposits are actually very similar in date. So there seems to be much less of a gradual development of raised bog on Hatfield, but rather something that is happening almost simultaneously in a number of different loci and one of the suggestions I made was that basically you're getting wet material being created within the inter-dune hollows. Perhaps localised development of peat there because the water table is so high, remember we're very low lying here, very close to sea level, so any change in sea level, any change in climate is inevitably gonna push up your water table and you're starting to get water perhaps sitting within hollows and eventually you're getting peat developing and then coalescing into a whole.

The recent research which has been carried out by Ben and Henry is indicating that there is an area on the north side of the moors where we actually have very unusual deposits which appear to be a sort of pool deposits and there we might have what seems to be earlier peat development. So the story has kind of moved on from when I did my original research and we think that that pool deposit may show the origins of peat development on Hatfield, but what's quite interesting is that we're still trying to work out, and I'm sure they can tell you more about this than I, is the relationship between the development of peat on the north side of the moors with the rise in water, water levels as a result of sea level change, because the development of peat is all happening at the same time as we're seeing increases in sea level and it, a general change in the climate from a more continental to a more oceanic regime and what I mean by that is more oceanic is the kind of, climate that we have today, much wetter, but the extremes between winter and summer are really quite muted. In a more continental regime you tend to have drier condition but the change between summer and winter tends to be much more marked, so you have warmer summers and colder winters. So the, the beginning of peat development on both Thorne and Hatfield Moors coincides with a fairly major shift in climate and this is recorded right the way across the British Isles.

The effect of sea level change in all of this is not that the Humberhead levels would have been flooded by sea water, what it is likely to have done is it has likely to have had an impact on the river systems. So as the river water flows out into the Humber Estuary perhaps as sea level is increasing you're

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starting to get a backing up of the water and you're getting localised flooding. Some of that may be in the form of literal flooding from the flood plains themselves and the river systems but also the whole water table is starting to become saturated and what we're still trying to work out for instance is the relationship between the increase of water, perhaps as a result of climate change and the development of raised bog in, in a raised mire. So we know a lot about what's happening on the raised bogs themselves, perhaps rather less on what is actually happening in the flood plains and in fact at the moment I'm trying to develop a new project which is looking at the interrelationships between those, those different systems. So what you're seeing is a connected system, the whole landscape is profoundly interconnected. So it would be a mistake to see both Thorne and Hatfield as sort of separate entities, far from it, they're part of the whole wider landscape.

*The rest of the moors in the country, why would Thorne and Hatfield be so important?*

Well for starters they're the largest raised mires in eastern England because raised bogs are developed largely because of greater water, you need more water basically to develop a raised bog, and because the east, the western side of the country is always wetter than the eastern side of the country, there's always going to be a bias towards the west side of the country to have raised bog development. So you have lots of bogs in places like Cumbria, you've got blanket bogs on the Pennines and so on. On the east side of the country, if you look around there's actually very few raised bogs and in fact what's interesting about Thorne and Hatfield is that they have developed in an area that is viewed as being at the margins of raised bog development. So in other words precipitation is so low but there is some question mark as to why they're there in the first place, which suggests that it's not just precipitation which is important in their development, the other issues that I mentioned, particularly sea level change and changes in climate may also be very, very important. So they're very marginal.

The other aspect is, is a bio geographic aspect, so anything that lives on the West, Westside of the country which is more designed for wet habitats compared to something that lives on the East side of the country and where it, it has a drier habitat, will be fundamentally different both in terms of the mix of species and the types of species that you have. So in fact, the greatest similarity to the raised bogs at Thorne and Hatfield is not the raised mires in Cumbria, far from it, it's actually very similar to the Baltic bogs, and this extends itself also into its invertebrate interest. So, for instance, the two species of beetle which are very well known for the raised bogs *Bembidion humerale*, which is a ground beetle, *Curimopsis nigrita* which is a byrrhid, the next place you can find those things is not in England it's in the Baltic bogs. So there's a wonderful connection between them. So it allows us to start to see Thorne and Hatfield, not as just raised bogs in Eastern England, not just in England, not just in the British Isles, but as part of a complex in Northern Europe and so as part of that they have a much, a much more important context than perhaps people appreciate.

*And have they, have those connections with the Baltic grown up because the environment's similar or because they were connected in some way?*

I don't know the answer to that question, all we know is that there are bio geographic similarities. At some point in the past, certainly before the English Channel was created sea levels would have been so low that you could have walked from Humber over to areas of Denmark for instance. So it's possible that that connection happened then, but I think it's unlikely, largely because the raised bogs of Thorne and Hatfield don't start developing until much later, i.e. when there is no sea connection. I think it's more to do with the fact that perhaps you have a rather unique environment into which you have a



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unique set of species and the nearest place where you get these similarities is in the Baltics. Undoubtedly there is a bio-geographic connection but how that has come about I cannot answer and maybe somebody else would be better placed than I to actually answer that question. What I can tell you is that the, the unique aspects of these sites are there present in the fossil record right at the beginning. So I've had *Curimopsis nigrita* and...

[Knocking at door]

[Pause]

So the unique aspect of these sites in terms of the connection with the Baltic bogs can also be seen through time. So if you look at the fossil insect record back four and a half thousand years ago you get the same species occurring that are on the sites today, including *Bembidion humerale* and *Curimopsis nigrita*. They are there right at the beginning of bog development. If you compare my species lists which are four and a half thousand years old, the species themselves not my list, with for instance Peter Skidmore's modern list, what is incredible is that there is amazing overlap between them, you know, something like fifty or sixty percent of the species that I get in the fossil record are in the modern record. So it shows you that the origins of the biological interest of these sites goes back thousands of years.

What's also interesting which fascinates me is the fact that some of the really interesting species that you get in the fossil record are associated with the buried woodlands and not all the species but a goodly number are still present on the site today. So I once read that, I think its Thorne Moors is something like the fourth or fifth most important insect fauna for its woodland species in the British Isles. Now that is mind boggling I think because what it's saying is a raised bog has an important set of woodland species, why is that, well I can tell you the answer to that. The reason is, is because the woodland that lived there four and a half thousand years ago survived at the edges of the bog as the bog developed, sometimes invading across the site, sometimes moving out, but it has maintained, it has had an impact on the wonderful invertebrate richness that is the site's today.

Now inevitably the sites today will be over, will be dominated by the raised mire assemblage but there's also this important subset of woodland species and that's why I say that I think it's a mistake for conservationists to perhaps ignore this. So for instance I know that quite recently English Nature were removing the pine trees off, aspects of Lindholme for instance or the edges of the moors. Well all the evidence suggests that those pine trees have been living there and their successors for thousands of years. So you have an English pine forest still being preserved through, through the generations and why is this important, it's important because in most places Scots Pine in England has disappeared and in most places it's deemed to be an introduction. So most of the pine woodland that we get today, the Scots Pine, this is the native Scots Pine, is what we see in Scotland. But in England it's largely disappeared, but I think in places like Thorne and Hatfield in particular Hatfield it's surviving in these little edges. So it's particularly galling when conservationist with, what are quite traditional views of nature conservation, then come in and misguidedly remove these trees, when I think they've been part of that habitat for a long, long time.

So I think the, the kind of records that I look at, because I look at changes over long periods of time it allows you to see how the sites develop, how they change and it gives you a long term perspective which I think modern ecology just doesn't have and I think because of that one could start to talk about

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different ways in which the sites can be conserved.

*Can you say something about, from your, stand point, the impact of the different stages of peat milling, the peat industry on the moors?*

Well I think there's reasonably good agreement that things like hand cutting which is done on a moderate scale, in some respects actually increases diversity on a site like Thorne and Hatfield Moors, because it generates a mosaic of different habitats and so it actually has enriched some areas of the bogs. Where you're getting large scale hand cutting you're then starting to degrade the bog landscape but I think the major changes which are evident is where you're getting industrial milling because there is no chance for any of the species to, to safeguard themselves, there's no refugia, the bog itself is drained and so the environmental history which is encapsulated basically just becomes dust and eventually, it blows away in the wind and the whole site is drained. So it has a catastrophic effect upon the bog itself and, I mean, if you go onto the sites today it's pretty heart wrenching to see how much of the peat has gone and I would have to say good luck to English Nature because they, I'm sure they'll be able to reconstruct something, but whether it's really what was there previously, well I mean it's never going to be that. I think one has to always accept it's going to be different.

I think what concerns me greatly though is that people have a rather plant centric view of the world and as long as it looks pretty and is sort of planted up nicely, people may like to kid themselves that they have reconstructed a raised bog but if you look at the invertebrates they're not going to be there, and maybe, maybe eventually they will start to come back in a few hundred years time but you have to ask the question where are the refugia. Luckily there are some areas of refugia and maybe they will reinvade back out onto the sites but I think any work that has to happen will have to happen over a considerable period of time. So I think it's a moot point that humans have managed to destroy an eco system which has taken four and a half thousand years to develop in probably little more than about twenty years. But then we've done exactly the same thing when you look at climate change. I mean, if you look at the effect of climate change, the major effects that we are having now are really probably in the last fifty, sixty, seventy, maybe a hundred years.

So for millennia human beings have been living in the world and managing to have a relatively minor ecological footprint and I say minor, they have been, they have had an ecological footprint but the massive expansion of population and use of the natural resources now means that today we find ourselves in a really precarious position and my view is, is that we have done that all in about eighty years and that, and the earth, the environment has been the way it has for thousands and thousands and thousands of years and look at what we've done in eighty years. It's a scary thought and the kind of legacy that we are leaving to our children and our grand children is very, very concerning. The utter destruction of the landscape and you know, boy are we gonna reap the benefits of climate change and we're really are gonna have to sit up and make some changes to the way we live. But sadly I'm, I'm not convinced that people are gonna be prepared to make the climate changes which are needed now.

*We talked about climate change four and a half thousand years ago.*

Yeah.

*Can we draw any parallel to, between the climate change that we are likely to see now?*

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No, I think we're likely to see much, much bigger changes. The kind of climate changes that we've seen in the past, certainly in the last ten thousand years, have not been particularly major. There's perhaps been one episode about eight thousand two hundred years ago what is also known as the 8.2 Event where there have been, there was a major change in climate. But the whole system righted itself. The kind of changes that I think we're in for are the sort of changes that you start to see at the end of the last Ice Age. They're gonna be rapid and they're gonna be very substantial. Nothing that we've seen in the last ten thousand years. So I mean, in some respects a lot of this is rhetoric because I think with the current climate change trajectory that we've got a lot of these areas are gonna be flooded by the sea anyway, so in a sense we may just have to let nature take its own course. But I'm afraid I don't have a very positive prognosis based upon what's happened in the past. I mean, we're off the scale now in terms of CO<sub>2</sub> emissions you have to go back to the time of the dinosaurs before looking at the kind of CO<sub>2</sub> emissions that we are creating now. We have never, ever, ever created that kind of climate change in the past that we are going into now.

*Could you tell me something about the process of the work that you do. If you go out on site, can you talk me through what you would do and then we'll move on to how that, how you extract the information from that.*

Yeah, well basically the way I would do my work is I would take samples from context and what I mean by that is for instance on an archaeological site I might take samples from a water logged pit and I might take layers of material. So I wouldn't just take one single baulk sample although sometimes that might be appropriate but I might take spits of material out. If I'm working on a raised bog for instance I might take samples from inside some of the trees, the rot holes that are preserved inside, by the bog and in other cases I might take a section, say for instance, look, looking through a drain section and actually take out layers of material so every five to ten centimetres I would take a block of peat out. My samples are actually quite substantial unlike other paleoenvironmental proxy work I might take several litres of material out of peat. So I would take a whole sort of section through the bog itself.

*From top to bottom?*

From top to bottom. Then I would take it back to the laboratory and using a series of sieves I would then remove any silt fraction which is left over. Now in peat you don't get much silt fraction but say in clays or a lot of archaeological deposits you would get a significant silt fraction. What is then left over on your sieve is the organic material, so in the case of peats, you get a lot of organic material because that's what peat is, fundamentally. If you're working with archaeological material you might just have a thin layer of organic material and by that would be, it would be undegraded plant remains, insect remains, bits of wood and so on, and to that I add paraffin which I then mix in with the organic material and I add cold water and effectively what happens is the insect chitin then floats to the top of the water. What happens with raised mire materials is you tend to find everything floats, sadly, because there's a lot of air and plant remains within the raised peats, so I then I sort of decant this material into a series of jars with alcohol and then I have to sort the plant material and remove the insect chitin from it and eventually I have a sort of little fragments in a Petri dish such as this one here that I am showing you.

*Are these, when you say these are insect chitin, what do you mean?*

What I mean are head capsules, thoraxes, these are the middle part of the insect and then the wing cases everything else is not preserved or it's not identifiable and I then basically match up the fragments to

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extant material using a modern insect collection.

*So a bit of a jigsaw to reconstruct an insect?*

That's correct, yeah. So you just reconstruct the different aspects and then I start to look at the proportions the different families, the different species and then I look at their individual biology and then I can start to reconstruct over time how each sample changes. So you can start to see more water beetles coming in when it becomes wetter, maybe less water beetles when it gets drier, maybe more species associated with fen environments earlier on in the bog development and then later on in the bog development fen species disappearing and ombotrophic or acid loving species coming in. So you can actually start to track the development of the bog as the insect species respond to the different environments and if you're looking at, for instance, the bottom of the bog and you've got the forest then what you get is a forest insect fauna and that is fascinating in itself because it allows you to get a window upon the primeval British forest and I've done a lot of work on that and basically you get an incredible range of species, many of which are extinct in the British Isles today. Many of which now live in isolated little enclaves in central Europe, in undisturbed forest habitats, and what they show is the massive changes that we've had to the insect biota of the British Isles, a lot of it associated with ancient forest.

So you get this wonderful window into the primeval forest and it's absolutely unique and the wonderful thing about this, in addition to giving us some idea of how the insect fauna itself has changed, how it's been impacted by climate change, human activity, is it allows us to start to give people who are involved in conservation of natural woodlands, modern woodlands, an insight into what the real, the forest really looked like. Because all the forests that we see today are fundamentally the product of millennia of human activity. They're not natural, they're anthropogenic landscapes, so humanly-made landscapes, and if you want to try and conserve species and manage them then we need to think about what those kind of landscapes look like in the past.

So a lot of my work is about helping, you know, helping us understand A, why the landscape looks like it does today, how it has become the landscape it is today and also providing insights into perhaps the kind of landscapes we should be conserving and what we should be moving towards. So a lot of my research, although it might appear esoteric has very close applications to modern conservation today.

*Can we move now to, to a specific project that you worked on in Thorne, well it's on Hatfield Moor actually.*

Yeah.

*Which was the discovery recently of a track way.*

Yeah.

*Can you tell me how you were involved in that and how you...*

Well...

*Became involved in that?*

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I became involved in that really because I hadn't, I mean I finished my PhD in 1998 and since then I have been publishing various papers about my PhD research and I knew Ben and Henry had been working out on Thorne Moors, primarily.

*Perhaps I should stop you there then, perhaps it might be the point in which to actually ask you a little bit about how you came to be where you are and that might lead into, what, the question I just asked. So maybe we should start by saying how did you arrive where you are today?*

Where I am today. Well I did, I went to Sheffield University to do a Masters in paleoeconomy and environmental archaeology and I had a degree in archaeology which I was awarded from the University of Newcastle and then I went off to work in London for several years in retail, and I kind of went out of archaeology because at that time there wasn't any work and then about five or six years later I decided to do a Masters and I went off to Sheffield and my fascination at the time was actually animal bones. I wanted to study animal bones from archaeological sites and then I was introduced to quaternary entomology by Professor Paul Buckland and I kind of became rather fascinated by the insect fragments and it was really when I decided on my dissertation project that I decided that I was definitely going to go down the route of looking at insect remains and Paul suggested that I study an assemblage of remains from Thorne Moors and that's really when I was introduced to Thorne Moors as a result of that work and really as a result of Paul Buckland who introduced me to the site and I did my MSc and at the end of the MSc Paul suggested that I stay on and do a PhD.

So I waited a year for funding and the following year I was funded with a scholarship from the University of Sheffield and I started my research looking at primarily Hatfield but also I did a little bit of work on Thorne Moors and really the title of my PhD was the, The Holocene Development of the Wetland Landscape in the Humberhead Levels from a Fossil Insect Perspective, and my focus was very much on the moors but I also tried to put them into their wider context, the flood plains. Perhaps I was less successful in the wider context simply because there was so much work to be done on the moors that I wasn't able to do very much on the flood plain work and I finished that work in 1998 and in early 1999 I was awarded my PhD and then I left Sheffield and I went to work at the University of Exeter for about six months and then I was appointed to my present post at Queens University Belfast.

That was seven years ago, almost seven years ago and I went over there because I was interested in looking at more raised bogs but in Ireland this time because there'd been so little work done in my discipline in Ireland and over the years I kind of remained very committed to looking at the moors, I'm still a member of the Thorne and Hatfield Moors Conservation Forum and I've still remained, sort of, passionately interested in what's happening on the sites as well as publishing my research and when Mick Oliver found the track way site I was immensely excited because I spent vast numbers of hours out on the moors looking for archaeology and not finding it. So when Ben and Henry were asked to be involved in excavating the site they then came to me and asked me if I would be interested to look at the insect remains which of course I was delighted to do so. So I kind of remained involved in looking at the moors for I guess now twelve years and in fact at the moment I am trying to set up a new project which is to continue this work but this time using a PhD student, so allowing somebody else to kind of succeed with some of the work that I've done and developing further work in this area.

*Why would they ask someone who works with insects to come and look at what seems to be a wooden track way?*

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Well because insects are very useful environmental indicators, they can tell you a great deal about the depositional context of the track way itself. So, for instance, we were interested in knowing whether the track way was deposited on fundamentally dry peats, or on wet peats. So was the track way the response to increase in wetness on the site or was it because people wanted to make use of essentially a fairly dry area which was perhaps getting slightly wetter or perhaps had come out of a wet phase and was starting to become dry again. So we were looking at the insect remains as well as other remains which Ben Gearey's looking at to see what was actually happening on site at the time of the deposition of the track way.

The insect remains directly associated with the peat above the track way were also looked at and we were primarily interested to see whether there were any wood associated species which might have come from the wood that was, that the track way was made of and the reason we were interested in that is that a lot of wood associated species can tell you quite a lot about the kind of woodland from which the wood had come from. So whether it was a very old woodland for instance, whether it was relatively new, what kind of state it was in and if the whole range of different species were sufficient you can start to say something about for instance the structure of the woodland from which the timbers had been taken from. Now in this particular case there wasn't enough information to give us that level of detail but because I'd done so much work previously we knew a lot about the wider environment anyway.

*Could you tell whether the wood came from, where it, from actually, from Hatfield Moor or whether it was brought from a distance?*

I think almost certainly it came from Hatfield Moors and the reason I think that is that the track way is made of pine and there is abundant pine all over that area and pine tends to be out-competed away from the moors, simply because it likes quite open habitats and it tends to be out-competed by other tree species. On Hatfield because it's quite acidic, you've got the sandy sub soils and you've got the acidic bog, raised mire sediments it's much, it's quite happy there and a number of other species which might normally out compete it can't live there, so I think we're pretty sure that these are local trees that were probably grown either on the bog itself or in the margins.

*You've outlined what it is, the questions that, surround the track way that you were, maybe able to help with, how would you approach that, what would you actually do to answer these questions?*

Well, it was mainly Ben who took the samples. I mean, I went out to visit the site, but basically we would take samples from beneath the track way and above the track way and then I mentioned these pool peats which appear to be closely associated with the track way, so we also took samples from the pool peats and in fact I'm looking at those right now to get a better feeling for the conditions associated with the very early stages of the track way being built.

*I've spoken to the person who found the track way.*

Yeah.

*And the archaeologist that came afterwards, what was your, how did you first hear, you said that Henry asked you to go along. What was, what did you see when you first visited?*

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Well I first, I first heard of it from Mick Oliver because he let the forum know, and so we knew within twenty four hours and Henry and Ben asked me to go out to look at the site, I think it was in their first year of excavation. I was tremendously excited because not least of which because I'd spent, I'd spent the whole, about three or four months field walking that whole site and finding frankly nothing in the way of archaeology. So for me it was a tremendously exciting moment to go out there and see the site and I guess in my own mind I thought what I was gonna see was some little track way but it was far from it. It was quite extensive in nature and it was just really exciting thing to, you know, to see this and not least of which because it actually gave some context to a lot of the work that we have been doing and it allowed one to really visualise human beings moving across that landscape in a way that, which previously had been harder because the archaeological evidence there was much more amorphous and difficult to get hold of.

*What do you mean by, being able, it was able to give you some context?*

Well I suppose you could actually visualise people moving across that landscape as opposed to sort of having to think well yes they might have, they might not have, we don't actually know, but here we have tangible evidence that, you know, people have moved across this landscape and also had felt sufficiently, that it was sufficiently important for them to put a track way and platform on it. So it had significance to them and I think there's a certain investment in putting down a track way, so why bother if this is not an important area to you. So it kind of brought the human aspect of what a lot of the work that I'd been doing really to the fore front.

*Where does it sit within the, within the peat layers?*

It sits quite close to the basal layers so it must have been constructed really in response to either increasing wetness in the area or to a temporary drying after a wet phase but I think that much of the evidence seems to point in the direction that before the track way was constructed you had what was possibly a wet, wetish heath environment and this is evident in the very dark, well humified peats that you get at the bottom. They're not traditional, they're not very traditional of raised bog peats so I think you have quite a dry acidic environment across which presumably grazing, you know, animals would have moved around whether they were grazing or wild animals. Quite useful hunting territory I would have thought and then what appears to be fairly sudden transition from this into raised bog peats, which would suggest the water table increased very, very rapidly and so whether what you're seeing here is a response to that flooding, or, you know, increase in water, by the construction of the track way.

*And you've presumably found insect evidence that supports?*

Yes, yes, I mean that's, there's insect evidence to support that as well as other environmental proxy evidence to support that idea.

*Do you have an approximate date for the track way?*

We do, but don't ask me what it is, because I can't remember what it is! You'll have to ask Henry.

*In general terms, when you talk about human activity, what kind of economy and lifestyle, if you'd like to put it in that way, would the people who built the track way be living in?*

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Well there's quite a lot of debate about the nature of settlement of this time, I mean this is a Neolithic track way and most people traditionally see the Neolithic as the beginnings of large scale, you know, agriculture basically. The moving over to agricultural pattern of life, cultivating crops, looking after animals, herding, settled life ways. But increasingly there's been a lot of debate within the British archaeological community about the nature of early Neolithic settlement in many areas and that archaeologists have increasingly argued that it's still quite impermanent that they still, rather than seeing this massive change over from hunter gatherer way of life through to agricultural way of life they see a much more gradual transition to the use of domesticates and that domesticates are perhaps only used in a particular times, maybe at times of great ritual significance, perhaps at particular times of year or whatever, but they don't, they're not advocating this sudden switch over from the hunter gatherer lifestyle through to an agricultural lifestyle.

This is by no means accepted, and certainly there's a lot of debate about this and environmental archaeologists are sort of still quite actively discussing the nature of the economy at this time. There does seem to be evidence in some sites for quite large amounts of cereal remains for instance and, there's only, the only way you can have cereals is to, you have to cultivate them, you have to invest time in the land and that suggests that you have to have a certain amount of permanent settlement. Some archaeologists appear to suggest that you can sort of put your crops in and then disappear and then maybe come back six months later to take your crop but I think anybody who looks after gardens knows full well that that is not how crops grow. So unless your, what your wanting to recover is so miniscule then it doesn't actually matter but if you want to make some kind of viable crop harvest then you have to look after your crop and I think a number archaeobotanists have increasingly suggested that what you've got is really like garden agriculture, quite intensive and localised and perhaps we should really move away from this whole idea of extensive agriculture which is so typical of our own landscape. But if you, if you intensively cultivate a landscape you can actually get relatively high yields from relatively small areas, especially if you're manuring them and it's quite clear that different areas of the British Isles are different.

So for instance, in Southern England there seem to be quite extensive areas of cleared landscape into which a lot of the ritual monuments are imbedded, places like Avebury and so on and Silbury Hill, but in other areas there is much more concrete evidence for settled houses and so on in a way which is much more amorphous in the Southern of England and the same is also true in Ireland, there is a very different story happening in Ireland. We have lots of evidence for settlements, houses in the early Neolithic, evidence for crops and so on, perhaps the best example are things like the cager fields, these very extensive fields which, you know, fields systems which must have indicated fairly large scale agriculture. But how, how characteristic that would have been of the whole landscape is a moot question and I think archaeologists are now starting to realise that ideas that have been generated for particular parts of the country may not necessarily be applicable everywhere. So this is a rather long answer to your question and I think the answer to that is really, I, I don't know enough about the archaeology of the local region to be absolutely clear, but there's a lot of debate about this at the moment and I suspect it would have been quite mixed and that the use of natural resources, wild animals would have been equally as important as perhaps the use of domesticated resources and perhaps after all if you look at the landscape, this wonderful different ecotones, you know, why would you bother, you know, moving over to large scale agriculture when you have this wonderful resource, wetland resource, which must have been full of bounty. So you know, you have to ask these kind of questions.



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*Would the insect remains that you found be affected by a change over to agriculture and domesticated animals?*

Yes they would. Not so much the insects that I recovered from Thorne and Hatfield Moors, largely because they are raised bogs and so they are atypical of the wider environment. But certainly if you look at the fossil insect record over time, and I've spent a lot of time looking at this particular issue, you see a major switch over from basically wood dominated environments through to what has been termed culture step environments, these are assemblages of beetles which are dominated by things like dung beetles, things like pasture species.

So you see a major shift in the formal assemblages from a forest environment to an agricultural environment, which is substantially cleared and you can see this transition very, very clearly at a number of different sites, including in the Humberhead Levels. So for instance I looked at an assemblage from Rossington which is on the Torne and you see fairly dramatically this big decline in species associated with woodlands and a big increase in pasture and dung species and again you can see this in a number of sites across Britain, this major shift. But you really see this major shift happening not really in the Neolithic, I think it's more happening in the Bronze Age, that's where you see this major transition I think, change in the landscape use.

*So actually dead insects from the historical and archaeological record can tell us a lot about a wide range of things.*

Oh yes absolutely.

*From climate change through to what people probably ate.*

Yep, through to the landscape, through to their living conditions. I mean, on archaeological sites, urban archaeological sites particularly through the work of people like Harry Kenwood in York, he's been able to show the living conditions that people were living in, which were not terribly nice or salubrious, many people had lice and fleas and all sorts. Another example is I was working on eighteenth century tenement housing from Dublin and some of the material's very interesting because some of it is dated over time, in the earlier phases the site was associated with a market, it was called Newmarket Street and in the later phases it was associated with tenement houses and you can actually see the degradation of the housing reflected in the fauna as the fauna gets more and more disgusting and frankly by the, by the eighteenth century material you're getting cockroaches and things like that coming into the insect fauna which are suggesting that the, the living conditions of these people was far from salubrious, so you get a wonderful insight into people's living conditions which normally you couldn't get from any other archaeological record. So yes it can tell you a great deal about living conditions the kind of, sort of, conditions associated with a lot of archaeology as well as wider landscape issues and you can, you can tell the whole story of the development of the British landscape looking at the insects remains and in fact I'm writing a book about this right at the moment.

*Now you now live in Ireland.*

Yes.

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*And you've got an interest as you say in what's going on in Ireland. Do you still have, but you still maintain this interest with Thorne and Hatfield Moors?*

Yes.

*Through the Conservation Forum.*

Yeah.

*Can you, can you say how you might move forward in the future with this connection with Thorne and Hatfield Moors. Is that going to continue or..?*

I think it's likely to continue. I've an enormous fondness for the sites, I'll always be interested to know what's happening there and there might be periods of time when I do less work there, but what I've found is that there seems to be a pull that keeps on pulling me back, each time I think okay I've done that I'm gonna move on, something else happens and I think well actually I'd quite like to go and do something else. I think it's, I think it's related to an intimate knowledge of the landscape, I think, and this is probably true of a lot of archaeology and palaeoecology is that there's nothing wrong with working on a whole range of different site and indeed I do that, but the intimate knowledge of that landscape really adds an edge to what you're doing on an emotional and intellectual level because I am emotionally attached to the Humberhead Levels and the moors at Thorne and Hatfield Moors in a way I could probably safely say, of no other site that I work on and I think that's perhaps fundamentally bedded with the fact I did my PhD there, which a PhD is an intensely personal experience and because I know the landscape intimately and I, I don't think I will ever stop wanting to know what's going on there and being fascinated by that landscape.

*Thank you very much indeed.*

You're very welcome.

[Recording Ends]