

Mud Matters | EXARC

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Guests

Caroline Nicolay (UK) and Daniel Postma (UK)

Introduction

In this month's episode of Finally Friday we are talking **sustainable and natural buildings!** Most of us live in and around buildings every day, but could going back to historic or natural building techniques add new dimension to our architecture? This month Phoebe is joined by two experts from our EXARC community, Caroline Nicolay and Daniel Postma. **Caroline Nicolay** is an archaeologist and heritage specialist who focusses on the public's interaction, interpretation and experience of archaeology. **Daniel Postma** is a natural builder and archaeologist based in Scotland. His first involvement in experimental archaeology began in the research and eventual reconstruction of an early medieval turf building located in the north of the Netherlands and he is now a specialist in this material.

Transcript

It's the first Friday of the month, which means that it's time for the next episode of #FinallyFriday, bringing you insights and discussions from around the world focussing on experimental archaeology, ancient technology, archaeological open-air museums and interpretation.

Phoebe: Hello and welcome to #FinallyFriday. My name is Phoebe Baker and today I'm joined by two specialists from our EXARC community focussing on sustainable building.

Caroline Nicolay is an archaeologist and heritage specialist who focusses on the public's interaction, interpretation and experience of archaeology. She has worked in a number of open-air museums across England and France, but has since established her own living history and experiential archaeology company, Pario Gallico. With Pario Gallico Caroline particularly likes to focus on recreating Iron Age wall paintings, but she also works on other areas of history up until the Tudor period. More recently to complement her research in wall painting, she has begun training in the conservation and maintenance of traditional buildings.

Daniel Postma is a natural builder and archaeologist based in Scotland. His first involvement in experimental archaeology began in the research and eventual reconstruction of an early medieval turf building located in the north of the Netherlands and he is now a specialist in this material. Since then, Daniel has trained in contemporary natural and sustainable building techniques, which help contribute to a more holistic idea of how buildings in the past may have been constructed. His company Archaeo Build takes this idea further focussing on the interaction between past and present forms of natural building.

So, welcome both of you. Thank you very much for joining me. I think it's gonna be a great episode. So a question to start you off. Why do you think it is important that the public are aware of building techniques from the past? Who wants to take this first, maybe Daniel?

Daniel: Yeah, absolutely. I think there's a number of reasons why it's important that the public are aware of building techniques from the past. First and foremost I think it's a good thing to realise that building techniques from the past have been the majority of building techniques that humanity has used for their shelter throughout human evolution. And even though they seem maybe at first glance to be quite far removed from conventional building techniques, they still have a lot to offer and I think archaeology is well placed to highlight those potential benefits.

Caroline: In open-air museums especially, where I worked the majority of the time, I find it incredibly important to show an as accurate as possible version of how nice, how well-made and how well-thought - we know thanks to archaeology - the buildings throughout history and prehistory, were. It's particularly difficult to show how nice these were and all the techniques and the craftsmanship, the skills that were involved at the time, hundreds or thousands of years ago. When you visit well-made replica houses, I think you get a better understanding of how life was in the past, how skilled these people were already even thousands of years ago. It changes your perception of the past. It changes visitors' perception of the past, of their forebears and of how little or much crafts have changed through history.

Phoebe: I've got kind of, I guess, a shorter type of question, which is: what types of buildings are your favourites to take inspiration from? I know that you've both kind of similar backgrounds, but different types of buildings that you are interested in.

Caroline: I'm focussing on the Iron Age in Northwestern Europe, so Britain, Germany, France especially. I'm very intrigued and interested in looking at Iron Age Britain roundhouses, especially now more northern England, Scotland, up to Brochs and Crannogs especially. So roundhouses on stilts on the water and comparing to the northeast of France where Iron Age houses are not usually round. It's so close geographically speaking and yet the architecture is completely different. Why round in one place and square, rectangular in another? It's similar material, similar techniques, completely different architecture. So that's what I love looking at and I'm mainly interested in.

Phoebe: Yeah, that sounds really interesting why there is that kind of difference but similar tools, similar techniques. What about you, Daniel?

Daniel: I really like this question because, I had my suspicions, but Caroline and I have never really discussed how our interests might differ in this respect and I think just listening to Caroline's answer, my suspicions are confirmed; I'm more of the longhouse-leaning person. But interestingly, and I hasten to add that one of my particular interests is the relationship between roundhouses and longhouses and it's something that's come to the fore a bit more since I've moved to Scotland. We don't really have any roundhouses in the Netherlands, either Iron Age or prior to that, let alone early medieval period. So a lot of the research that I've done in the Netherlands has been focussed on longhouses, other rectilinear structures and since coming to Scotland and particularly through a project that I led last year here in Strathearn, that relationship to roundhouses has grown my interest in that type of structure. But basically I'm open to anything, I always find if you're not interested in something, you probably don't know enough about it, so that's all the more reason to follow that line of research - that in particular is what brought me down the turf route because basically that was of nobody's interest, so as a consequence that was one of the first materials I started looking into.

Phoebe: That actually leads me really nicely into another question. I was gonna ask when we are talking roundhouses and longhouses, are they more traditionally made out of things like wattle and daub or are they made out of things like turf? What kind of materials are these and what kind of materials are your favourite to work in?

Daniel: There's two aspects to that question. Firstly, the choice of materials for past buildings will have been very dependent primarily on the location of these buildings. You can still see that in surviving vernacular structures, for example here in Scotland, where on the slope of a hillside, so to speak, you might find turf buildings at the top where there's a moorland and peat can be cut as a potential source of building material. Moving further down the hill you might find turf used as alternating courses within a stone wall. And then as you move down that slope even further you might find less wetland areas and more clay deposits and that the alternating stone and turf changes to stone and earth mortar. And in the valley floor, if there's river deposits and clay soils or a salt marsh area even, you might find solid mud walls, or cob as they're quite commonly referred to. So there's a wide variation, but generally speaking, it would've been locally available, natural building materials. So could be stone, could be timber, could be earth, but usually it's a mix of stone, earthen materials, green roundwood mostly, and some fibres such as straw or other thatching materials, for example. When it comes to my favourite material to work with, that's a really challenging one. I particularly like to adjust the choice of materials to the setting of whatever building work it is we're doing. The excitement there is that it brings us closer to the way people built in the past. Every material that I've worked with so far has something unique to offer. Having said all that, I think turf is a particularly undervalued material. It's quite temperamentful, which I like. So yeah, if I had to choose one, I would still say turf.

Phoebe: Lovely. I really enjoyed how you talked about it does really seem like an interaction with your landscape and your surroundings what kind of thing you are able to build or want to build. Would you like to add anything to that, Caroline? What's your favourite building material?

Caroline: Earth, it's really hard, but earth, I would like to know more. I really want to learn more about earths. That's the problem. There are so many different kinds of it, clay especially, and there's different kinds of clay. It just never ends. But I find it so versatile. And as Daniel was mentioning that it's mainly linked to the local availability of materials. You can find earth and many clay soils and clay materials used in so many different places that I find it manages to be almost everywhere and my interest in buildings and building techniques mainly comes from my interest and my research in earth pigments or mineral pigments, so to make paints. And my first question was, how did Iron Age

wall paintings come about, or any wall paintings or effectively any paintings between cave art, which we know quite a lot about, and Roman frescos. We know and study a lot these two but in between there's just thousands and thousands of years of seemingly nothing as if we forgot completely that colour existed, was made, was traded, was transported, exchanged, et cetera. And suddenly the Roman conquest arrives in Gaul, Germany, in Britain and ta-da. We end up with Roman frescos again, and that's what I'm... was mainly interested in. The problem is if I want to experiment with wall paintings on Iron Age houses, we usually find in Eastern France and Germany fragments of painted superbly smooth earth walls, usually wattle and daub with various layers of renders or plasters - again, clay plasters - painted on with clay and earth pigments. So it's really hard to find remains unless the house is burnt at the time. We find these remains and they are very beautiful, colourful, completely smooth. But I needed to know more about how the walls were made under them to be able to make the walls, make the plasters and the renders, and then make the paint so I could eventually experiment with it. I'm not yet at the stage of experimenting at all, and I discovered that there is such a lack of understanding and such a lack of training in earth building, from clay plastering to just simple wattle and daub, that should be simple but unfortunately from my personal experience, we think we know and we actually don't. And that's why I am now looking into modern vernacular building techniques, traditional techniques and natural sustainable building techniques. Because there are people in the 21st century, all across Europe, all across the globe who work daily with earth and these natural materials, be it stone, timber, greenwood, all of them, they use them, they work with them, not just in a heritage context, but in a house that they live in or in houses that they are commissioned to make, by architects for modern people. So I have a lot of learning to do and I'd love to get that across to archaeologists and open-air museums and everybody experimenting with it. That there are people out there who know what they're doing, who are used to using these materials. And it just seems very logical to me to make a connection between archaeology and open-air museums, ancient materials and finds and these modern practitioners and just mix it all up in a great big, fantastic exchange party so we could learn more from each other and hopefully get to build new houses with ancient techniques and materials in a more sustainable way.

Daniel: Earth is particularly suitable for that. As Caroline says, it's so widely available and it comes in so many shapes and sizes and can lend itself to so many applications, like the decorative aspects that Caroline's been saying, but also the underlying structure like a wattle and daub wall, which is part of the building envelope, but also a more structural component so a solid earthen wall, or it can be part of thatching techniques actually and this is so unique to earth. In addition to that, it's infinitely recyclable as a building material. There's very few other, well, there's no other building materials that you can just add water to and reapply it. That's something well-known from building conservation, for example, where old clay plasters have eroded off of walls and the building conservator just sweeps up the old clay plaster, adds water, maybe adds a bit of straw and can just reapply that plaster after so many decades. That's amazing. And in addition to that, earth is a very accessible building material. So in terms of spreading that view, those ideas of using traditional techniques in a modern context as Caroline has just set out, earth is a great starting point. It can be great mud fun for children and it can be very technical for engineering PhD students. It can be mind-boggling for architects, it can be sculptural for designers. So yeah, earth really is an excellent and very interesting building material.

Phoebe: I am really interested in this relationship between modern, natural building techniques and the archaeology. Could you talk a little bit more about how modern natural building techniques can help to inform and improve our representations? And actually how difficult is it to train in these materials? You kind of mentioned that a little bit in the end of your answer, Daniel.

Daniel: Yeah. I think as I said at the beginning, it's good to bear in mind in this context that we've for a long time lived in buildings built with natural building materials. So much so even that it has been suggested that people have physically evolved to live well and be healthy in earthen building materials, which might for the uninitiated be a bit of a contrast with the poor perception many people have particularly of earth buildings. The term mud hut, for example, is quite often just thrown around to indicate poor living conditions, poor financial situations, social exclusion, but of course those social economic conditions have very little to do with the materials themselves. You can build very high quality structures with earth and that's something that quite a few people have now caught onto to and certainly also a number of architects and builders. Some natural builders are actually being paid quite well to apply high-end earthen plasters in London homes or elsewhere across the globe. In terms of people being adapted to living in the environment that natural building materials can create, a good example of that is that our skin works best within a relative humidity of between 40 and 60 percent, any higher and the air is so humid that we might get eczema or other fungal issues might start to develop. Any lower and issues such as asthma, for example, might crop up. Clay as a building material and to a lesser extent, but also quite good, timber or other porous materials (so breathable materials as they're often referred to) do a very good job at regulating in a passive way without the intervention of any mechanical ventilation system as we're inclined to use nowadays. These natural building materials passively level out fluctuations within the indoor relative humidity. So much so even that if you were to apply an earthen plaster, a clay plaster within a bathroom, your mirror doesn't fog up. So that's how effective these natural building materials are.

Phoebe: Oh wow!

Daniel: I think that also illustrates how useful they are within a modern context. Although this is generally fairly well-known among the initiated, it's not very well-known within construction at large, it's certainly not something that's being taught in architecture courses. So it's very much down to the individual trying to broaden their horizon and find out more about the benefits, the pros and cons of natural building materials. Then the next challenge would be to find the skills to actually apply them. There's a particularly big challenge: there is no training to be got in the use of natural building materials. There is, to a degree, within building conservation that is along the margins of the educational stuff, mostly workshop-based tuition to be had for people wanting to develop their skills. But a lot of it, I can safely say, would be down to organisations such as Earth Building UK and Ireland [<http://ebuki.co/>] and the like to make these workshops available to either tradespeople or enlightened homeowners looking to acquire these skills for themselves. So there's a big challenge there and something certainly that Caroline and I are working on to resolve.

Phoebe: Would you like to add anything to that, Caroline?

Caroline: I find it very interesting what Daniel is saying, that in a modern context these materials, like clay plaster for example or clay floors, are sometimes found now in the 21st century in quite designers' houses, designers' interiors, quite expensive places, some are in museums. There's the National Museum in Edinburgh that has a clay plaster as part of the decor of the archaeological collections on display. Everything that Daniel said I found mind-blowing a couple of years ago. But there's a few key information that once you understand them, it's not as hard to get more and deeper into using wattle and daub and cob and clay without needing the skill of a plasterer or needing to acquire that skill, you don't need to go that far right away to start with. Now, if you take these mind-blowing facts - it's breathable, it's fireproof, it's sound-dampening, it saves humans quite a lot of health issues and all of these things - take that and put them in a prehistoric, in an Iron Age, in an early medieval context: that's how important it is for replica buildings in open-air museums to be able to present as accurate as possible, as well made as possible replica houses, because

visitors need to feel it. That's what I keep finding in many places, even in modern earth building environments. You need to feel the difference. You need to feel an earthen floor. You need to experience staying in a wattle and daub well-built house. You breathe better, you are calmer. Temperature is better regulated and all of that works even better, I find, in a replica house context because suddenly you have an open fire and it changes the way the building or the walls and the floors with these very same materials act. A good example, I find, is a site called Samara Archaeological Park in the north of France, which I worked at 10 years ago, and I'm lucky enough to be working with again since last year. I usually take them as an example of excellent practice because they used traditional materials. They worked with local building schools or engineering schools for young people to practice on and their tutors to have projects for them. Anyways, they used these materials and they made replica houses from the Iron Age again, absolutely perfect in what I can see personally in the archaeology on the side of the floors, the floorboards, the wooden uprights, everything on the walls from being a very nice wattle and daub to smooth, layered plasters, then painted with the actual correct pigments, let alone designs. And it gives this incredible sensation that we are stepping in a historic house that we would very happily live in - or at least spend the weekend in - as 21st century people who are used to, of course, a different set of comfort. It doesn't have electricity and wifi, but we would very happily see it as a liveable space. And it suddenly gives us and visitors these questionings, this comparison to modern houses, to where you live at the moment and gives even school children something to compare their own lives with. And suddenly the past isn't that far away anymore. People are not that different anymore. And maybe in the Iron Age people didn't wear, you know, tiger skins and walked around half naked with a big club. That's what I would like open-air museums and other places to show. This different idea of history and prehistory.

Daniel: If I could just add to that, I think Caroline raises a very important aspect and certainly something that we've been battling to some extent against when we're out in the field running natural building workshops - and that aspect is the perception of natural building materials. And as Caroline explains and to some extent caricaturizes to make her point, is that the perception of the quality of these natural building materials has significantly changed from what it has undoubtedly been in the more distant past and since the arrival of, funnily enough, something called The Enlightenment. The past 200 years, or at least in the UK the past 200 years as industrialization took place and businesses experienced increasingly a financial incentive to sell products over natural building materials, which were generally sold in their raw state - maybe lime was burnt, that was only just coming up in that timeframe, but certainly building stone, timber, earth was sourced as a raw material on site and the costs of construction were down to paying labour wages for the actual tradespeople on the ground. Of course, industrialization produced larger companies with larger overheads and a more stratified economic system, more heavily processed materials leading to products such as plasterboard or fired bricks or pantiles, these sort of things. And of course, nowadays, there's a wide range of building materials available. The whole setup of our construction industry changed. As part of the Enlightenment thinking, one of the paradigms that took hold and that's actually been quite well documented and published on, in particular by researchers from University of Stirling here in Scotland [Referring to: Parkin, S.J., and W.P. Adderley. 2017. 'The Past Ubiquity and Environment of the Lost Earth Buildings of Scotland'. *Human Ecology* 45 (5): 569–83. <https://doi.org/10.1007/s10745-017-9931-4>.], is that it became part of the Enlightenment propaganda, if you like: to play down or to put down the quality of natural building materials. That's how the choice of materials has become associated with poor living conditions and poor social economic conditions. I think there is an important part for open-air museums in particular to play to acknowledge the influence of that Enlightenment thinking on our perception of past building traditions and to provide a counter-narrative and certainly now in the more recent years with growing awareness of climate related crises, ecological crises unfolding, we find, looking at the

archaeological record, that a lot of the solutions we now look for have been there in the past. Archaeologists and archaeological open-air museums are particularly well placed to provide access to these past solutions and explore ways in which we can make them more relevant again to our modern needs.

Phoebe: That's really interesting what you've both said about how such a recent change in perception it's been to see these building materials as kind of lesser than the ones we have now. I wanted to link a little bit into what you were just saying at the end there, Daniel, and what you've said as well, Caroline, and talk a little bit more about how experimental archaeology centres and open-air museums..., do you think they're the only place that we can represent these types of buildings and do you think there's a place for places that aren't open-air museums or aren't open to the public for experimenting with these types of things? Are there experiments that you kind of need the public to not be there to function, if you catch my drift?

Daniel: In addition to open-air museums, I think there's an increasing number of opportunities outwith the heritage sector. And that's something that we've been looking at (we being Archaeo Build, in collaboration with other organisations such as Historic Environment Scotland and archaeologists from the University of Edinburgh) to see if we can take these natural building skills that have a historic or even archaeological precedent, see if we can find ways to take them out of the sector and increase demand for these skills and materials within the wider community. And I think in Scotland, we're particularly fortunate that there's now a new planning legislation focussed on the construction of huts - so small, up to 30 square metres, generally seen as something that are owner-built that sit very lightly on the land [<https://www.thousandhuts.org/>]. And the hutting movement emerging on the back of these new planning arrangements have a particular interest in trying to source the materials locally and in fact, on the hutting forums online, or within the communities discussing what they might build on their woodland sites or on the Scottish moors or whatever you choose to build these leisurely cabins, if you like, examples, vernacular examples feature quite regularly - so Icelandic turf houses, for example, 'hobbit holes'. But a lot of structures along these lines seem to tickle the interest of the hutting community. At current, there's no way really for the public at large to access the knowledge base or the skills base required to actually build such structures. So, I think there's a lot that we can gain in that segment. And that's something that we've been starting to exploit over the last few years, notably within a project called the Grassroots Hutting Project [<https://edinburgh-innovations.ed.ac.uk/case-studies/grassroots-building-from-past-to-present-and-future>] that we ran at the eco campsite Comrie Croft [<https://www.comriecroft.com/>] in Strathearn last year, which Caroline was also involved in. And that was a project where essentially we took an Iron Age roundhouse and made a reconstruction model based on archaeological concepts, both in the terms of its material use, so the use of turf, for example, and the use of bracken for thatch but also design aspects, using cuppills or crucks if you like, as a basis for the roundhouse construction rather than the African model as it's sometimes referred to with a circle of posts and a ring beam. But also in terms of its use, so moving it away from being an archaeological reconstruction as such, but trying to tweak it in such a way that it would appeal to the hutting community. And it was mostly, in fact, people outwith the heritage sector that were joining us for the workshops at Comrie Croft. This was a very interesting project, that we'll hopefully be working on again this year. So in summary, I think the point I'm trying to make is that within the heritage sector, within our archaeological open-air museums and historical open-air museums and of course within building conservation, although that is a quite small sector when it comes to surviving pre-industrial vernacular buildings, but also within the modern natural building scene, be it on a small scale for hutting or on a larger scale for, well, anything up to dwellings or

even community buildings, classrooms, I think there's a lot of potential there to experiment with what is essentially archaeo-based design: the use of traditional building practices and the ways we can adapt them to make them regenerative, both in social and environmental ways.

Phoebe: Do you have anything you'd like to add to that, Caroline?

Caroline: When I met Daniel and chatted with him about what he was doing and the project, especially the Grassroot Hutting Project, the hutting concept in Scotland offers so much potential for archaeo-based designs and research or practice into traditional craft, vernacular building techniques, which means without an architect pretty much, and so on and so forth, that it's just such a hyper modern setting to put everything together that it really is incredibly interesting. I'm hoping that it's not just Scotland that has these kind of things or maybe people just building, you know, their own cabins, in the woods on some land or things like that, or who have different building regulations in Europe. What I'm still really, really keen on myself is to bring not just archaeology to the modern natural building scene, but bringing these professional natural builders to not only teach or help open-air museums, but also to find a space where they can safely experiment. For example, I know Jeffrey Hart, who is a professional earth builder; he focusses on earthen floors, on clay floors [<http://jeffreynaturalbuilder.com/>]. He's interested in earth and he heard and we chatted about, protein floors. So, blood floors and milk floors. So clay, earth floors bound with a kind of protein and we can't in archaeology figure out if this protein, animal-based protein, is dairy-based or is animal blood-based. And they are both existing precedents in traditional buildings. So he would like to experiment with a blood floor, as delicious as it might sound. The problem is he seems to have offered that possibility to a few of his clients. But of course, when you talk about a blood floor or try to sugar-coat it as you like, it still is animal blood or black pudding materials that are added to a clay floor and nobody has for now been interested in the idea or even if you are interested, it will take several weeks to cure, to set, to stop potentially smelling a little bit bad. So it's not easy to experiment with that in a modern setting and let alone to find a client, you need to observe regulations and you have a set budget and you have a timeframe. Anyways, when you want to experiment with something, especially with ancient techniques, you need a bit more time and you need a bit of an understanding space. And to me, that's really what especially archaeological, but open-air museums can provide. They are in the south of England, some open-air museums who have historic buildings with chalk and milk floors, so 'cheese' floors and they are making repairs. But I don't know of any but one building in the north of England where a group of volunteers has tried a blood floor. So my point would be there are traditional, ancient, potentially archaeology-connected techniques that could be revived and could be useful in a form or another, that professional natural builders don't or cannot experiment with and can't get acquainted with because they don't have the opportunities. So if that could be provided by open-air museums to modern professional natural builders, then there is this exchange of both skill/knowledge, craft techniques and safe spaces for everyone to experiment and reach the same point.

Daniel: The experimentation is really crucial to developing new applications of traditional building practices. I think it's good to realise two things really. First of all, a lot of the things that we know of archaeologically, building techniques or building materials that have been used in the past, all the associated knowledge and skills, have been forgotten. What we see within building conservation now and surviving traditional buildings, even the pre-improvement, vernacular structures, is just the tip of the iceberg. So how do we relearn what we've forgotten? For archaeologists wanting to relearn, basically, in order to understand what they see within the archaeological record, they need to be able to access somebody with the relevant knowledge, even though those skills and techniques are no longer used. Alternatively, they need to develop those skills themselves. So they need a safe playground, if you like, to relearn these things. Similarly, it's good to acknowledge that -

and rightly so - the construction industry is quite a conservative industry. It's usually big sums of money involved, major health and safety issues. So yeah, if you know that a particular technique, say casting something in concrete works very well, why would you change to building your wall with earth mortars? From a modern perspective there seems a massive risk involved there. So again, for those tradespeople or architects or self-builders looking to adopt, well, I suppose you could say alternative building techniques (although from an archaeological perspective, they're not all that alternative - that's up to us to get that message across!), but at least to change their way to something that's more regenerative, they too need, of course, in addition to find access to the relevant skills and knowledge, they also need a safe space to then hone their skills and get them to the point that they find the confidence to put it into practice or to be able to develop their skills in such a way that it becomes financially viable to provide particular skills or techniques as a commercial service, such as the example of Jeffrey Hart's blood floors, that Caroline just provided. An interesting example maybe is the way that I started out in turf construction. One thing I was keen to try in a reconstruction that I did in the Netherlands [<https://exarc.net/venues/yeb-hettinga-museum-zodenhuis-nl>], which was for a small open-air museum in the northwest of the Netherlands, was to test how it was possible that the early medieval turf walls in longhouses in that area had been load-bearing, which seemed like completely counter to all common understanding of what you could do with turf construction. Yet clearly the archaeological evidence was indicating that the early medieval longhouses definitely had load-bearing turf walls. So that became a key aspect of that experiment. But the experiment at the same time was to produce a building that was safe for their visitors. And, throughout that project, there was a big contrast in a way of what made it worthwhile for me as an academic researcher and what made it worthwhile for the museum and in a way has motivated me to find opportunities to try, to experiment with building techniques on a smaller scale and maybe outwith open-air museums. The hutting is a great route, but also on a smaller scale, like, a couple of years ago I worked with Falkland Estate in Fife in Scotland to set up a natural building school [<https://www.youtube.com/watch?v=BPUajtWggCY>]. And we've since had two sessions, two runs, with a small number of workshops. These have been quite a safe environment for me as a workshop facilitator to explore funny ideas within earth construction with our participants and not with the aim of producing a building that's going to be sound or it's going to stand up as you might expect from a fully-fledged building, but just to explore something. In all honesty, we don't quite know if it will work at all. So the first year, for example, we made a turf bridge, a bridge with a 1.2 metre span over a little ditch just in the field that this Build School is run and the bridge, the arch over that ditch was made with a turf arch, just to try it and see if that's even feasible [<https://youtu.be/-ieKXt6CFT0>]. Ultimately, that bridge very gradually started to collapse and it's now been taken away, but it's stood up just fine for over a year. I think with some adjustments we can push that even further. That's not something you can do for a paying client, but a workshop, if set up in a suitable manner can be very good for trying such an experiment. It really made the most of the uncertainties within construction and trying to adopt new (at least for us new) techniques and materials and make what is potentially a downside into something beneficial - to use that to create excitement and interest among the participants.

Phoebe: That bridge sounds incredible!

Daniel: Well, I should maybe elaborate a bit on the second workshop as well, which was similarly experimental and I ran that in collaboration with Becky Little, a well-known mud mason in Scotland [<https://www.rebeearth.co.uk/>]. What we did there was we built a mock-up hut, a timber hut. And there was actually a proper timber hut built on the same site. We just made a, like a quick and dirty alternative to it using second-hand pallets and scaffolding board. So it wasn't a proper hut and never intended to last very long. But it provided a frame for us, quite literally, to try out different earth building techniques [<https://youtu.be/YmY9OZvnA8U>]. So there it was that we filled in one

panel with turf blocks and in another panel we put in light earth insulation, which is primarily fibres such as straw, which are then held together, as they're compacted, with a minimal amount of clay slip. So it's a very light and well-insulating type of earth construction. There was a range of other techniques such as kebbler and mott (or mud and stud as it's known in Lincolnshire) or wattle and daub, and mud block (or adobe as it's more widely known). All these different earth building techniques were used and at the end on display within this mock-up structure. So just to get back to my point, natural building workshops in themselves became an experimenting ground for exploring these archaeo-based ideas, traditional techniques and materials, applied in what could be a modern environment.

Phoebe: Sounds like there's lots of spaces where these kind of techniques can, should and are being used. And it's nice to hear about some of the differences about open-air museums versus these workshops and the construction industry and completely separate things as well. I wanted to take it slightly away from what we've just been discussing and I wanted to ask: are there historic examples still standing of natural buildings? Do you think that being built in these natural materials may hinder its perceived value as an item of heritage? This is a point that you brought up in your Building Sustainability podcast [<https://www.buildingsustainabilitypodcast.com/historical-turf-construction-daniel-postma/>]. I thought you gave an interesting answer, Daniel, so I thought I would ask it to both of you.

Daniel: First of all, I think traditional buildings, generally, are built with natural building materials. Even within our urban environment like tenements in Scottish cities and even more so in the countryside, be it farmsteadings or cottages. Generally these will be built with locally sourced, albeit quarried stone, sandstone if available for ease of extraction, igneous types of stone as an alternative, slate, milled timber. So these are all natural building materials. Lime as a render on the inside. That's certainly in Scotland the bulk of surviving traditional buildings. If we push our view slightly further back to those buildings preceding the Enlightenment period, so generally end of the 18th century or earlier, you'll see that instead of quarried stone field boulders might have been used; instead of lime mortar, earth mortar might have been used; instead of milled timber, roundwood timber might have been used; instead of slate, thatch may have been used initially - survives in very few places in Scotland but sometimes evidence for thatch still survives on chimneys, for example. So some of those buildings still stand, though they are getting increasingly rare. It's quite sad, really, to realise that the oldest buildings are generally also the smallest. They used to be ubiquitous, so they're also taken for granted. It's not fully acknowledged, not sufficiently acknowledged anyway, that these buildings are getting increasingly rare and they're starting to disappear from our landscape. And within planning, there's very little really to battle that. Quite often the budget available for building repairs is relative to the size of the building or the level of craftsmanship involved. So consequently, the bulk of building conservation projects, the bigger ones anyway, will be big, luxury country houses. Funnily enough, it's the built heritage of the wealthy few that we're prioritising over the built heritage of the common folk. So a big challenge is to find a way in which we can ensure that those 'lesser' buildings, for lack of a better word, the longhouses that still survive, the little cottages that are earth-mortared, those very few that are still thatched, where do we even start to make sure that the buildings but also the skills needed for their repair and upkeep are maintained. In fact, that's something that I've had lengthy discussions on with Historic Environment Scotland, as it's a major concern for them as well [<https://www.historicenvironment.scot/learn/skills-and-training/>]. They have their hands full trying to get lime, Scottish slaterwork, traditional carpentry embedded in the building curriculum and there's no chance really that earth building or let alone turf construction or thatching or any of these older vernacular techniques can be included. There's just no interest for these techniques and materials within the construction industry at large. Also from that perspective it's a shame really, that because

of, as it's called in building conservation, the use of inappropriate materials or inappropriate past interventions, particularly the use of cement for repointing, the application of plaster board as dry lining in interiors, potentially even the addition of moisture regulating membranes (basically plastic lining on the inside of traditional buildings) really interferes with the capacity of natural buildings to breathe. Breathing, being a slightly confusing way of saying that natural building materials are moisture-permeable; so what you get in these traditional buildings, being natural buildings, is that moisture generated primarily on the inside, so by hanging up washing to dry, by having showers, by running baths, by even just being alive and breathing, we all fill the interior with warm, moist air, and it's desperately trying to move out of the building and then it's either absorbed by the plaster, which won't let it go; it can't move out because there's a plastic lining behind it, or if even if it manages to get through those barriers - it will travel quite happily through the sandstone walls or through the soft lime mortar - and then it finds itself being blocked by cement render, which is impervious to moisture. The effect is that these traditional buildings tend to get very wet. They get saturated with moisture. As a consequence, they get very cold. That just contributes even further to the poor perception of natural building materials.

Phoebe: That's a really nice way of highlighting how many of our buildings are made of these natural materials.

Caroline: Many eco museums or open-air museums all across Europe, the vision of heritage, and its value might differ from the country you're in, the country or your local building traditions. For example, if you go to the east of France in Alsace or in many parts of Germany, Hungary, and Austria and all Eastern Europe, people are still happily living, building, or repairing effectively wattle and daub or daub buildings. They might be on lathes instead of wattle, but it's these medieval - quite early actually medieval - and up to 16th century houses with decorative wooden beams across panels and the infill of panels is daub. It's a clay-based material and then it will turn into bricks. In such places, I don't know if you would see earth buildings as a heritage or of any value at all because at the moment it's still a very current thing. So you would see more valuable new materials, that maybe in Britain at the moment we consider pretty horrendous, cement and concrete and plastic membranes and all these non-breathable materials that are so problematic. But in other parts of the world, of Europe, it might be a very valuable new thing. And unfortunately these natural buildings will be, are maybe left aside. So that's something I would really be interested in hearing about from the overall EXARC community. What is it like in your part of the world because that's a question I absolutely can't answer. Where I come from in Eastern France, there are many farms that are still, yep, made of earth. If you go to Alsace, yep, everything is made of earth and it is probably heritage, but it's such a common sight that it would be really hard to get the idea that you could maybe put them in an open-air museum already.

Daniel: Large parts of the world's population, as Caroline says, still live in earth buildings. The use of earth, in particular, it somehow remained outside of the archaeologists' view. Whether or not that has to do with its perception and maybe earth being undervalued as a potential material and thereby not getting the attention from archaeologists it might deserve or not, I can't really say. I can only say that it seems to have applied to the perception of turf in the Netherlands, where most of my research has focussed on. But in terms of finding new applications, when we look at finding new ways to apply these materials, what we lack certainly in the UK, are good examples of what that might look like. So even if we would be highly successful at preserving the early vernacular structures, will that not just remain something of the past? What can we do to entice people to adopt these ideas as modern regenerative building practices? So I think it's important to provide an example of what you could do with buildings, how you can make a traditional, pre-improvement building meet modern expectations in terms of comfort and wifi connections and all the rest of it.

Perhaps the best way is to practise what you preach. For those reasons recently we have acquired a site in Perthshire, an old farm right on the boundary (the temporal boundary) between past crofting - the crofts were still drawn in on the estate map from the late 18th century whereas the building, the property that we bought wasn't, but the later buildings are...the steadings, typical of the Enlightenment period: this cluster of buildings that we now have here in Little Bellyclone is right on that transition from pre-improvement vernacular to the Enlightenment - larger scale steading design type of construction. The cottage that we have here was one of the last of two buildings within the parish still to be thatched. It now has Welsh slate, but there's little keeping us from reinstating that thatched roof. The walls are made with field boulders and earth mortar. It used to function as a farm, but it's not a steading as such. It's a cottage with a workshop attached to it, a little barn, separate, set perpendicular to the cottage. It's an ideal environment really to showcase, of course historical examples of natural buildings, but also seeing that these buildings here have been empty for about eight years and are quite derelict and in need of thorough repair work; we can demonstrate how you might go about making appropriate repairs using suitable building materials that respect the need for traditional buildings to breathe, to remain vapour-permeable. Also, to invite people over to host workshops. And that's something that Caroline and I are now discussing: to set up a dedicated archaeo-based Learning Centre here in Perthshire, so that we can invite people in to provide exactly that safe environment for people to experiment, to acquire skills, to meet like-minded people and to find new ways to apply all the good things that traditional natural building practices can bring to the modern built environment.

Phoebe: That brings me on really nicely to my closing question, but before I go onto the question, I wanted to say thank you so much for such an interesting discussion. It's really been a pleasure listening and it's been really interesting hearing about how archaeology and natural building and sustainability and all of these ideas kind of interlink and interweave. So my last question is: what are your plans for the future and how can the EXARC community help to make a difference in regards to the points you discussed today? I know the two of you are working on a project together, which you've kind of introduced, Daniel. It sounds really cool.

Daniel: Yeah, it's all very early stages. We've literally just moved on site not even two months ago. Our priorities are still very much just clearing all the overgrown vegetation, trying to get water connected, have a stable internet connection, all these things. At the same time Caroline and I have sat down for the first time to discuss our plans, actually earlier today. That's how fresh all of this is. So our future plans as far as working together is very much to share our interests and share what we've learned so far and expand our learning by hosting a wealth of natural building workshops, all with a view to exploring past building practices and how we might apply them in a modern context. So in terms of where the whole EXARC community could feed into this is, you are all sitting on a wealth of knowledge, archaeological understanding of past building practices that we would love to hear about and any questions you might have about how things have worked in the past, particularly the things that don't seem to make sense (like building with turf in general didn't seem to make much sense to the archaeological community prior to me looking into this), yeah, we'd love to hear from that and see how we might provide a space here for either museum staff to come over and train with us or train with some of the craftspeople within our network or to run experiments to see if we can find a way to make sense of what we're seeing archaeologically, or even just interesting concepts. One aspect that we were working on with the university of Edinburgh and Tanja Romankiewicz in particular, was the idea of Iron Age roundhouses themselves being fully recyclable and part of a nutrient cycle that ended up producing fertile soil for agricultural purposes, where essentially you're composting your entire building material, which seems like a completely mad idea potentially from a modern perspective but there's actually historical evidence for townships in Scotland and the longhouses that were built there having been used exactly in that

manner. So not just in a practical term but also on a conceptual level I think there's a lot of material that we can explore and hopefully Little Bellyclone and the Learning Centre here can provide a forum for that.

Caroline: Absolutely. As Daniel was saying, that's all pretty new and very exciting. What I would be very, very keen on in an ideal world is being able to travel to different sites, EXARC partners or go and meet people and see other examples of open-air museums, archaeological sites, be it archaeology or history and traditional buildings and building techniques. Only last year I had the immense pleasure and chance to travel to Sweden for a few days and visit - to me - very recent open-air museums, 1900s. My god, that's a thousand years newer than I usually see! And I learned so much about techniques that could be applied to Scotland, for example, or to the east of France because we all have the same natural environment, weirdly enough. So within EXARC, I would ask if people are interested, try to look deeper into your local area and find these professional natural builders and traditional craftspeople who are around. Even if you don't see them, if you haven't heard of them, they are there. I never heard about the entire huge French earth building scene because it mainly is happening in central France and in the west. I'm sure there's loads in the east that I don't know about. So really dive into that, have a look and if you are interested, create connections. It would be lovely to make a sort of EXARC-supported platform all across Europe, all the world where we could have sites that are interested in a technique and a lot of natural builders or professionals and craftspeople who are interested in joining in, open-air museums or archaeology, for people to just connect with each other. And then, yeah, as Daniel was saying, welcoming delegations to visit Scotland and see what we can do or have to show in this part of the world.

Phoebe: They were two fantastic answers. Thank you again, Caroline and Daniel, for joining us today and sharing your experience and expertise. I know that I certainly learned a lot and I'm sure that our listeners did too. And a big thank you to everyone else for listening in to this episode of #FinallyFriday by EXARC. If you would like to become more involved with EXARC, why not become a member? Alternatively, you can make a small PayPal donation through the website to help support EXARC in its endeavours.

Join us next month for another episode of #FinallyFriday and learn more all about the world of experimental archaeology, ancient technology, archaeological open-air museums and interpretation. Don't forget to follow the show through exarc.net and our associated social media channels. See you soon!