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Bodies, building and bricks: Women architects and builders in eight international eco-communities

Jenny Pickerill

University of Sheffield

Abstract

Eco-building is a male domain where men are presumed to be better builders and designers, more men than women build, and women find their design ideas and contributions to eco-building are belittled. This paper suggests that a focus on bodies, embodiment and the ‘doing’ of building is a potentially productive way to move beyond current gender discrimination. This paper makes three key interventions using empirical material from eight case studies of eco-communities in Britain, Thailand, Spain, USA, and Argentina. First, it uses a focus on eco-communities to illustrate the enduring persistence of gender divisions in architecture and building. Second, by using multi-site examples of eco-communities from diverse countries this paper finds more commonalities than differences in gender discrimination across cultures and nationalities. Third, it outlines three spaces of opportunity through which more gender-neutral approaches are being developed in eco-building: (a) in challenging the need for ‘strong’ bodies; (b) by practising more embodied ways of building; and (c) by making visible women’s bodies in building. The ‘doing’ and manual aspect of eco-building is unfamiliar for many (not just women) and interviewees commented on the need to (re)learn how to be practical and to understand the physical possibilities (and limitations) of their bodies. Although much work remains to facilitate more gender-neutral building practices, an embodied approach has enabled women and men to begin to move beyond gender as a

defining difference and re-define their building skills and capacities in relation to their diverse bodies.

Key words

Building, architecture, gender, eco-communities, bodies, embodiment

Introduction

Building a house involves multiple overlapping processes; the design (often formally termed architecture), the construction or building, the finishing decoration and the occupation. Gender divisions, however, have long marked these processes. Historically men have been associated with the structure and women with the interior and decoration of houses, the construction industry has long been a site of gender discrimination, and women remain under represented in architectural practices (Rendell, 2000; Ness, 2012; Lorenz, 1990). This paper explores whether a focus on bodies, embodiment and the ‘doing’ of building is a productive way to move beyond current gender discrimination in design and building practices.

As a small but growing subset of house building - eco-architecture (the design) and eco-building (the construction) - seeks to consider the interdependent relationships between people, buildings, environment and climate (Pelsmakers, 2012; Ward, 2011). In essence eco-architecture requires radically reducing waste in the production and occupation of houses. The common functions of an eco-house are for a building across its whole life-cycle to minimise resource use, minimise waste, and maximise use of renewable energy and renewable materials (Borer and Harris, 1998; Pickerill and Maxey, 2009; Williams, 2012; Roaf *et al.*, 2007). Eco-building is a diverse and contested array of approaches, designs and methods. The self-build approach where the intended occupier undertakes the different processes of building and design, creates a space for alternative approaches to building. Many of these self-built eco-houses are constructed within eco-communities (as are all the examples used within this paper), which are explicit spaces of collaborative, collective and communal living defined by a variety of values, principles or criteria (Chatterton, 2013). Eco-communities are collaborations in ecological living and working together (Litfin, 2014).

Many eco-communities purport to be politically progressive and to attempt gender-neutral practices (Jarvis, 2013; Levi Martin and Fuller, 2004; Toker, 2000). As Eräranta *et al.*, (2009) argue a key driver for women joining in their case ‘eco-communes’ were “failures in performing the gender identity that the prevalent cultural narrative of the heterosexual nuclear family prescribes to them” (Eräranta *et al.*, 2009, 353). The alternative space of eco-communities offered such women an opportunity to experiment in new gender identities and relations; a new politics of the self. This involved dispensing with certain symbols of femininity such as cosmetics and building new intimate egalitarian relationships with multiple others.

Overall, however, there is little explicit analysis of gender identity and gender relations in the literature on eco-communities. While there is extensive work on gender and the environment (MacGregor, 2006; Gould and Hosey, 2007), and gender in environmental activism (Tindall *et al.*, 2003; Agarwal, 2000), the vast majority of literature on eco-communities ignores gender. This is in part because many eco-communities are attempting to move beyond gender categories to “a place where the fixed, sexually defined subject positions of a man and a woman can be refused, and people can be ‘just human beings’” (Eräranta *et al.*, 2009, 355). It also reflects academic attention on re-thinking family-centred identities and exploring gender alongside sexuality and heteronormativity in such spaces: focusing on predominantly *intimate* social relations rather than intra-community social relations. As a result gender has been largely treated as unimportant or uncritically. For example Litfin makes no comment on the gender-specific annual events she observes at the EcoVillage at Ithaca but is “curious about women who do manly things like driving tractors” (2014, 129). This lack of attention is despite the broader context where ecologically sustainable practices have a gendered dimension. As Organo *et al.*, (2013, 559) points out “the responsibility of everyday implementation and habit-changing commonly fell to women”, even within environmentally

conscious households. As such, eco-building is an important site for exploring the gendered nature of architecture and building because despite attempts at gender-neutral practices gender divisions remain.

Women have an illustrious history of architectural practice and involvement in building. However women have been constrained to the fringes of formal architecture and often confined to the more vernacular architecture of domestic design (Walker, 1989; Kwolek-Folland, 1995; Friedman, 2006). Women were limited to architectural practices deemed artistic such as interior decoration (Harvey, 2010). In the 1800s architecture was considered an amateur pursuit for wealthy women, few received recognition until the nineteenth century, and discrimination and underrepresentation continues to this day (Scott Brown, 1989; Brown, 2011; Caven and Diop, 2011; Ahrentzen, 2003). In the USA a feminist movement of the late 19th century sought to design kitchenless houses, moveable walls and community dining halls as a way to free women from their socially expected roles (Hayden, 1978, 1981; Cieraad, 2002). By removing these chores from women's singular responsibility, the movement sought to value women's diverse contributions and remove their domestic burdens. Hayden's work illustrates the importance of building design in shaping buildings' usage and gender practices. In other words, house design structures gender relations (Madigan and Munro, 1991).

Women's views have been traditionally excluded from design decisions about houses in which they will spend most time, and architects have "denied women's expertise as homemakers of the house" (Rudolph, 2010, 88, see also Gürel, 2009). When women are empowered to design their own houses they can do so in radically different ways. This is best illustrated through the work of *Matrix*, a feminist architectural co-operative in London in the 1980s. They designed with women, for women (Bradshaw, 1984; Darke, 1984). They understood the architects' role as enablers to participants in creating public and private spaces

for people's (especially women's) needs (Foo, 1984). Salomon (2006) has argued for spaces of privacy and solitude for women, building on earlier notions that family members need their own 'territory' in a house (Madigan and Munro, 1991). The feminist approach has also involved a more theoretical critique of architecture as fundamentally based on the male body proportions, and exploring how patriarchal ideology is inscribed into public space (Agrest, 1993).

Women's role in construction has been similarly marginalised. Crews (2010) explored the role of women in the construction of indigenous pueblos (villages) in New Mexico, USA. Prior to the Spanish colonialism of the 1500s, women were in charge of building the houses. Men would provide the timbers and set them in place, but it was women who would erect the walls, plaster them and maintain the physical structure (Katz, 1982). In numerous other worldwide examples of vernacular architecture, it is often women who were the builders (Oliver, 2003). In Britain, working class women were nail and brick makers in the 1800s (Walker, 1989) and Livesey (2013) has documented the histories of women's involvement as building labourers during the Second World War, most notably in being the main labourers constructing Waterloo Bridge. *Matrix* were also hands-on in construction projects, learning building skills, and working on site (Bradshaw, 1984).

Despite women accounting for half the workforce in Britain, they make up only 13% of the construction industry's workforce; indeed "construction continues to be the most male dominated of all the major industrial groups" (Fielden *et al*, 2000, 113). Women are excluded through a multitude of cultural practices including long work hours, conflict, aggression, sexual harassment and informal networks of recruitment (Jones, 2013; Watts, 2007; Menches and Abraham, 2007; Dainty *et al.*, 2004). The potential for change to these cultural practices is limited partly due to the lack of a critical mass of women in the construction industry

(Greed, 2000; Watts, 2007). Women's employment status, pay and conditions are still marginalised. Moreover, the women who do work in the sector are often marginalised further by the jobs they do. Of those women working in the construction trades in the USA the majority worked as wallpaper hangers and woodworkers – interior (and often inferior) craft roles (Menches and Abraham, 2007, Ness, 2012). Despite class and ethnicity becoming less important in construction industries in recent years, gender stubbornly remains a marker of division (Thiel, 2007, 2013; Datta and Brickell, 2009).

This brief history of feminist architectural practice and women's involvement in manual construction signals numerous causes for gender divisions (such as political and economic structures, and a mind/body dualism) that might (or might not) be less prevalent in alternative spaces. Thus the aims of this paper are threefold. First, it uses a focus on eco-communities to illustrate the enduring persistence of gender divisions in architecture and building. Second, by using multi-site examples of eco-communities from diverse countries this paper finds more commonalities than differences in gender discrimination across cultures and nationalities. Third, it outlines three spaces of opportunity through which more gender-neutral approaches are being developed in eco-building: (a) in challenging the need for 'strong' bodies; (b) by practising more embodied ways of building; and (c) by making visible women's bodies in building. This paper does this using empirical material to develop a theoretically informed argument that a focus on bodies, embodiment and the 'doing' of building is a productive way to move beyond current gender discrimination in design and building practices. As such this paper contributes to debates about the usefulness of the concept of embodiment, fills a gap on gender divisions within eco-communities, and begins work on women's involvement in manual (eco)construction. This paper begins with an exploration of embodiment as a theoretical framework for understanding gender discrimination, moves onto a brief

methodology, and then uses a large empirical section to outline existing gender divisions and spaces of opportunity, which is then completed by the conclusions.

Gender, bodies and embodiment

The social constructionist approach to gender and the associated division between sex and gender is challenged and complicated by work on the body (Johnson, 1994; Reed, 2013)¹. A focus on the body acknowledges the importance of ‘corporeographies’ (Longhurst, 2001, 9) and requires that gender is understood as embodied, not simply a social construction written upon biological bodies, but a lived experience (Nettleton and Watson, 1998; Walby, 2011). The way people think, feel and sense, and our relationships to others, tasks and place is intricately shaped by our bodies. As Sharp and Gorman-Murray (2013) argue, there remains significant scope in geography to work with embodiment, and place the body centrally in our analysis of contemporary problems. This paper uses embodiment as a way to better understand the lived experiences of women designers and eco-builders and explore whether this approach creates more spaces of opportunity to overcome gender discrimination.

Embodiment is the process of understanding how attributes of our bodies (such as gender, strength, race etc) “intersect and give meaning to bodies and their interactions with the world around them; and that conditions of embodiment are organised by systematic patterns of domination and subordination” (Simonsen, 2000, 9). Our bodies are natural *and* social, political, situated, and complicated. There is no either/ or, mind/ body, strong/ weak dualism. Our bodies are not static, but dynamic, negotiable, moveable and changeable (Evans, 2002; Duffy, 2013).

Judgements about women’s capabilities and capacities are often rooted in the Cartesian dualism between mind and body and the associated assumption that it is possible to be

disembodied (Simonson, 2000). This division was only ever applied to men – the subsequent bearers of rational and universal knowledge – while women were forever consigned to their bodies, unable to free themselves from their apparent fragility, emotions, and irrationality (Rose, 1993). As such sexism and patriarchy is justified through these essentialist discourses around the capacities of male and female bodies. An embodied approach moves beyond these essentialised notions of gender: “embodied difference can be conceptualized in non- or anti-essentialist ways” (Mott and Roberts, 2014, 234). A focus on the body redefines how capacities can be understood, as Simonsen argues, “the practically oriented body continuously weaves meaning throughout the course of its existence, while its own forms and capacities materialize contingently through its interactions with others and with its environment” (2012, 16). Thus capacities are fluid and continuously learnt through interaction. As Newbery argues, our bodies are shaped by social constructions *and* subsequent daily practices:

The female body is disciplined to be less physically capable; diet regimes, clunky footwear, and an obsessive focus on surface appearance hardly encourages the development of a strong body. The notion of weakness becomes imprinted on the female body in both discursive and material terms through a kind of performative feedback (2003, 210)

Exploring embodiment opens up how bodies are inscribed by social forces and structures, how normalising discourses seek to discipline our bodies in certain ways, and how society is not good at “integrating the different, or the difficult” (Evans, 2002, 5). Accepting that all our bodies are different, that they are amalgamations of natural and social forces, brings into question any certainty about what bodies are or how they should look; instead there is ambiguity, diversity and fantasy (Colls, 2012; Evans, 2006; Longhurst, 2005). Embodiment is about more than just the ‘body’ but fluidity and malleability “which means that it can take different forms and shapes at different times” (McDowell, 1999, 39). Indeed, bodies are fluid amalgamations. Longhurst (2001) asks geographers to acknowledge the messy materialities of

bodies. In doing so she outlines how our bodies are rarely stable, but rather fluid, permeable, volatile, leaky where bodies are “runny, gaseous, flowing, watery” (2001, 23). As Grosz suggests; “body fluids flow, they seep, they infiltrate; their control is a matter of vigilance, never guaranteed” (1994, 194). When this has been acknowledged, however, such leakiness is assigned to women typified by their menstruation, lactation, and sweat. Thus women’s bodies are cast as messy, out of control, dirty, troublesome, whereas men’s are (assumed to be, but are clearly not) stable, hard and solid (Evans, 2002).

Bodies also shape our experience of places and “cannot be understood outside of place” (Longhurst, 2001, 23). Bodies are entwined with places; “our bodies are a product of the complex interaction of different discourses, social relations, and practices constituted in relation to wider locations, including other bodies, the home and the workplace” (Valentine, 1999, 329; *see also* Nast and Pile, 1998). There is thus an important scale to an embodied approach to research that valorises the personal, everyday, fluid, flesh, and blood (Billo and Hiemstra, 2013). While providing some evidence to support these approaches to the body, this paper also seeks to further develop the concept of embodiment as a way to overcome gender divisions.

Methodology

This paper is based upon data gathered in 2010 from multiple eco-communities across six countries: England, Scotland, Thailand, Spain, USA, and Argentina (Table 1). These case studies were chosen to reflect a diversity of eco-communities in tenure, underlying vision, build processes, and societal context. It was particularly important to conduct international comparisons to account for different national contexts. All the fieldwork was conducted by the author who, having self-built an eco-house in England (as part of a two women team) and worked with Lammas eco-village (Wales) in a research and advocacy role, had a particular

positionality as a supporter of grassroots eco-building. This facilitated easy access to the case studies, but also predetermined an empathy with the goals of many the case studies. The decision to adopt a participatory action research methodological approach reflects this overt advocacy positionality and was driven by requests from eco-builders to garner greater political and social support for, and understanding of, their projects (Kindon *et al.*, 2007). This research was an explicit political intervention, recognising that the political work of the author is intrinsically embedded with her academic research.

Table 1: Summary of case studies (source: author's fieldwork)

In practice the extent of participation varied significantly between case studies. When possible the author joined in activities on site such as building, gardening, scything, cooking and eating communally, engaging in group meetings, socialising and staying on site for several days or more. Such engaged participation was possible at Tinkers Bubble, Panya Project, La Ecoaldea Del Michael, Green Hills, and Casa Tierra. I also attended a residential Earthship construction training course at Brighton Earthship in the spring of 2010. At Earthship Bioteecture while I was able to stay onsite for a week there were few communal activities available to join, it was only possible to visit Lama Foundation during one of their open days, and my visit to Ampersand Sustainable Learning Center was limited to a day, an interview and a tour of the site.

Twenty three face to face in-depth interviews were conducted in total. The ratio of interviews completed in each eco-community to the total number of residents at the time of my visit is noted in Table 1. Interviewees were initially asked to volunteer, to which the self-defined builders tended to be first to respond and then I sought out others on site who were building, or who were willing to talk with me. Interviews were conducted in English and Spanish. All interviewees gave written consent and were able to withdraw at any time. At each case study

photographs, field diary observations, and sketches of the site were recorded. At several sites it was also possible to access archival material. The roles of bodies were understood through observations, specific questioning and informal collective on-site reflection on participation. This embodied engagement with the eco-building process was reflected upon in field diaries, and the interviews were analysed using coding and iterative thematic identification.

Gender divisions and spaces of opportunity

Across all the case studies gender served as a form of division within communities, particularly in relation to architecture and building practices. There was a stereotype prevalent amongst the case studies that ‘men build houses and women make homes’, and consequently the women were constrained to support roles, internal decorating and childcare while the men did the construction. There are multiple assumptions made about women’s bodies which were similar across the case studies, these are summarised in Table 2.

Table 2: Assumptions articulated in the case studies about gender and eco-architecture and eco-building (source: author)

Bodies were evoked, implicated and excluded from building practices in three key ways, each of which will be explored using empirical material below: in assumptions about the necessity for strong bodies for building; in the need for bodies to practice building skills; and the ways in which certain bodies are more visible than others. Each of these also create spaces of opportunity through which eco-building can be challenged and reconceived in less gender divisive ways.

Strong bodies

There was an often-expressed assumption that the main reason there were fewer female builders at case study sites was because women were not as strong as men. Many male interviewees equated building as primarily requiring physical strength; “some things do require a lot of strength and a lot of having had practice ... when you’re holding a heavy thing and you’ve got to nail it into another thing” (Will, Panya Project, Thailand). For Christian (Panya Project), the act of building made the body stronger, “when you build your own house, you’re going to get stronger muscles and have a stronger body”.

Many female interviewees argued that women could be physically strong, that any strength requirements were easily navigated by changing practices, and that body strength was rarely the most important attribute for building. Shelley (Panya Project) noted that “it’s not just males, and it’s not just women that aren’t as strong. There’s a lot of strong women and I mean they’re physically bigger and they’re stronger that come through as well. It’s an attitude thing”. Changing building practices to reduce the strength required to complete tasks included making smaller bricks and Will (Panya Project) argued that they “redesigned the bricks to be small enough ... it’s adapting things to you - natural building is quite a personalised craft and you can adapt it to what you think is appropriate for your body”. It was also about altering the way materials were put in place. Amanda Bramble (Ampersand Sustainable Learning Centre, New Mexico, USA) describes how she adjusted the process of building an earth-bag wall in her house by filling the bags *insitu* and taking her time to rest between doing the hard work of tamping the bags:

You fill the bag on the wall in place, so shovel by shovel. You have a little bag stand it’s like you wrap the top of the bag over it ... You bring over a wheelbarrow of moist dirt and you just fill it right in place. You do have to

lift some when you're in a tricky spot and it's hard on the body. The main thing is tamping because after you've done a whole course or as many as you're going to do, then you have to tamp them really, really hard, and you're tamping them so that you feel the difference in the earth. You feel it start to be hard and ring ... you can tamp a few bags and then stop and breathe for a few minutes.

This process was very embodied, Amanda describes how 'hard on the body' it was, and how you needed to 'feel the difference in the earth'. Nathalia (Casa Tierra, Argentina) described the process of building with her male partner as a mutual understanding of their bodies, rather than a gender division:

The only thing that I always ask him to do it is mix with the shovel because now I'm pregnant I cannot do very low ground level work. But ... if we need to mix I prefer my mix, or we work it in a wheelbarrow instead. There are things we ask each other to do, I think it's about your body and your relation with the body.

Beyond adapting practices to reduce the need for strong bodies there was also resistance to the suggestion that strength was the most important criteria for successful building:

The physical aspect of building is to me a small aspect. There's so much you have to do right. You have to really pay attention to what you're doing, and those details or just making things plumb or level, you really have to think ahead in order to integrate what's going to come later and later and later with what you're doing now ... It takes so much more than

just your brute force, and it's a lot more important, that thinking stuff.

(Amanda Bramble, Ampersand Sustainable Learning Centre)

Amanda begins to suggest not just that there is more to building than strength, but that strength itself is more than just 'brute force'. Similarly in Gregory's (Panya Project, Thailand) argument that "you don't have to be like super burley and super strong or just like a freak to be able to move stuff to build a natural house. It does take a lot of work but with just a bit of perseverance, anybody can do it", the practice of perseverance hints at a different way in which strength could be conceived.

Figure 1: Alix Henry and Amanda Bramble (source: author)

The assumption that only male bodies are strong, and that only strong bodies can build (reifying the male body), has been challenged by, mostly female, eco-builders who have sought to illustrate the complexity of both building and bodies. Assumptions around 'strong bodies' have created a space of opportunity for female eco-builders to prove how embodiment is central to understanding building practices. It is not always useful to simply compare strength between bodies; "we tend to divide people into strong and weak ... rather than understanding all of us as, in some way, *strong enough*" (Newbery, 2003, 212, emphasis in original). In illustrating that knowing ones body, adapting practices for ones body, and acknowledging the diverse ways in which one might be 'strong' both challenges gender assumptions and creates space for all genders to reflect upon and improve their bodily experience of building.

Bodies of practices

Skills, capabilities, knowledge and competencies are more important in architectural design and building practices than strength, and such skills often require using our bodies. This is especially so in the case studies where construction was self-built and architects were often actively involved in the physical labour of building. Some of the most popular forms of eco-building are natural techniques that can be quite labour intensive (such as straw bale or adobe). The importance of using the body in building was undermined by a myth that women were not as good at science and engineering as men, and this in turn hindered their ability to design and build houses. Sometimes this was expressed as blatant discrimination, as Alix Henry (eco-architect, New Mexico, USA) has encountered; “construction and architecture are highly male dominated professions and so to be in it as a woman has its challenges ... there’s a huge amount of discrimination against women in the [architecture] profession”. At other times it can be subtler. Gregory (Panya Project, Thailand) argued that more artistic approaches to building were more inclusive, especially to women; “I feel as if it’s more accessible to more people if it’s not a science but an art, and natural building sometimes feels more of an art to me than a science”. This inferred deference to women being more creative and artistic was experienced by a fellow female builder in the eco-village, who felt that while artistic contributions were accepted from women, they were rarely allowed to be involved in the practical structural designs; it is worth quoting Shelley at some length here,

With gender it’s more than just the physicality of it. I don’t think that’s so much of an issue. I might make the bricks smaller but I can still lift them and I will lift them. It’s the communication and it’s the way that the feminine approach interacts with the masculine approach and how to merge those two in a productive way. Finding and exploring the power of

each approach and harnessing that, this started to happen towards the end with the toilet project. There was definitely a more feminine presence in the creative aspect, men seemed quite happy to let women somewhat direct the artistic side of things, but when it comes to talking practically they're a little bit challenged. There needs to be a bit more of men coming in and being creative. There are a lot of creative men that live here and come through here, and there are a lot of practical women who come through too. It is allowing both sides to acknowledge that. (Shelley, Panya Project, Thailand)

As Shelley articulates, creativity and art are not limited to women and nor should they be perceived as so. Many men are creative, just as many women are good at science and structural design (Lacuone, 2005). There are three processes at work here. The first assumes that science is not a creative act, whereas much scientific endeavour is highly creative in the ways in which new ideas are tested and understood. The second process is an assertion of the mind/body dualism where men's minds are deemed more highly valued through their assumed scientific superiority. Finally, the importance of the body for building is undermined through the privileging of mental acts of science, delegating the body's role to one of simply providing strength.

Women and men sought to challenge these processes of gender exclusion by articulating and practising a more embodied approach to eco-building. Rather than seek to directly illustrate an equivalent understanding of science and engineering (which would have compounded the mind/ body dualism), interviewees asserted the necessity to know ones body, that building skills require an embodied practice, and that the capacity to build was reliant upon a holistic set of skills and abilities that all genders needed to learn. Mike Reynolds, the architect of

Earthships (New Mexico, USA), described this as a mixture of dexterity, strength, temperament and training:

People are radically different from each other. Some people should not even attempt to build their own home ... they just don't have the hands for it, they don't have the strength for it, they don't have the temperament for it, but then lots of them should and could. It's a matter of educating people on what is needed to do these buildings, and some will find that they can do it and some will find that they can't. It's like some people can handle a four-wheel drive automobile and some should just stay with an automatic little sedan, and some people should have somebody drive them.

Kirsten Jacobson (Earthship Bioteecture, New Mexico, USA) concurs that the work of self-building an Earthship is “physically demanding and takes some level of skill and tenaciousness to figure out the details. It's more than just pounding the tyres. You've got to really think about all the systems and how they work together, and you need to know how they're all going to work together as you're doing it”. In Argentina the Ruizes (at Casa Tierra) who were first taught natural building by two women believed it was necessary for all genders to better understand and know their own bodies and their limitations. As Diego Riuiz argued, building required creative judgement, which both genders needed to learn and practice through embodiment:

There are many cultures where women were completely in charge of housing and also it's like you have a preconception that building is not for women because it's hard work. Alright, many men that I know they think it's [not masculine] to be carrying straw, but many aspects of the natural building is working with the materials, with the fibres, with the soil, it's

very feminine. Because you need to use your sensitiveness to know if it's soft enough. Of course there is a lot of hard work, but many women can do it.

Regardless of whether being sensitive is a feminine trait (and this statement might be complicated by its translation from Spanish), Diego identifies the necessity to use ones body to work with the building materials. This is exemplified further by Gregory (Panya Project, Thailand) who advocated that students learn about materials through their bodies:

Your hands know what it is within minutes ... when we're actually making it, can you feel that this is too dry? It's crumbling. Can you see it's too wet? It's puddling. When you stomp in it you can feel that suction. If you slap it on your hand and it sticks, that's what you're looking for. After that thing happens, the body retains this information ... I try to really encourage people to listen to the thing and let their body learn.

This form of bodily engagement with eco-building has been encouraged by hands on training and workshops (for example, see Figure 2, with Paulina Wojciechowska of *Earth Hands and Houses* who ran numerous workshops in clays and making natural plasters). It was through these sorts of workshops and training opportunities that women were able to embrace new skills in the bodily practice of building: "It's incredible for women to have the training here and get the strength to have these skills and to have control over that part of housebuilding. We always joke about homemaker, I mean really you are a homemaker" (Alix Henry, eco-architect, New Mexico, USA). Builders such as Shay Salomon (USA) and the Mud Girls (Canada) encouraged women's participation by leading women-only builds. For example, Salomon led a group of women who built small vault dwellings at the Lama Foundation, a

small straw-bale house with a cordwood front (Figure 3). That this workshop was for women-only created a ‘safe place’;

For a lot of women who came they had never picked up a hammer or a screw gun, and just having a safe place to teach them, to show them how to do it, to let them practice, without judgement or some jerk standing over them ... There was a question once of like can the men come watch the women ... and the women decided no, because they’re just going to be watching us bend over. (Chelsea Lord, Lama Foundation, New Mexico, USA)

Such a space also prevented men from taking over, as “it’s very easy for someone, males like carpenters, ... he could make it look so easy and ... when a female who doesn’t really have much experience comes in males are very quick to go alright, don’t worry, I’ll do that” (Will, Panya Project, Thailand). Hence the need, as Jones (2013) has argued, for women to create their own working environments. In Argentina it was only through women-only workshops that women could be encouraged to build: “if we don’t put that this workshop is for women-only they don’t come ... the main reason is that women don’t feel like that they can do it. Maybe as a woman you just need to see other women doing it. Because they say hey, she’s doing it” (Diego, Casa Tierra, Argentina).

Figure 2: Paulina Wojciechowska teaching at Brighton Earthship, 2010 (source: author)

Figure 3: A small dwelling at The Lama Foundation, New Mexico (source: author)

These women-only workshops created a space in which people could practice, make mistakes and gain in confidence. One house at Tinkers Bubble (Somerset) was built by a woman – her first self-build, with no money, and just some advice from others. She built a beautiful cosy small building out of natural materials. She acknowledged that it was not perfect, and she would in hindsight have done some things differently. But having the freedom to learn through doing, to explore her own approaches and methods is as important as ensuring women have the skills and knowledge to build.

This emphasis on embodying building skills extends to improving practices of communication, particularly spaces for questioning and listening. Despite having built her own Earthship, Kirsten Jacobson (Earthship Bioteecture) had experienced being overridden by men: “I definitely came up against a lot of dealing with going to the hardware store and knowing what I wanted and having someone tell me that’s not what I want ... and being pretty dismissive of me”. Part of this listening is being open to a diversity of approaches and questions. Likewise Shelley (Panya Project) had found her questions ignored:

Being a woman I have felt when I’ve made suggestions or asked [questions] ... that wasn’t acknowledged. I partly think it was gender but not wholly, ... healthy questioning isn’t always taken well, especially from a young woman who might not have much on the ground experience of building, but personally I think I’m quite practical.

The myth that women are less scientifically able than men created a space of opportunity to articulate and practise a more embodied approach to building. By identifying how much of eco-building is reliant upon dexterity and skills practiced through the body (such as knowing and feeling soil mixtures), building becomes rearticulated as a combination of mental and physical skills and competencies which are less associated with a particular gendered body.

In/visible bodies

Women's contributions to eco-building in the case studies often appeared less immediately visible than men's. A number of different processes conspired to de-value women's contributions and place them in the home (rather than building it). This invisibility, and subsequent undervaluing of women's work is part of a historical trend whereby the work that it was assumed women do (such as childcare, cooking, cleaning, etc) was located in the less visible spaces of private homes and thus did not constitute real work (Blunt and Dowling, 2006). This attitude extends to eco-building practices where the many roles that women perform (collecting build materials, organising training workshops etc) are deemed support roles rather than the 'main business' of design and construction. This creates a double bind for female eco-builders that, as Alix Henry (eco-architect) describes, simultaneously ignores women's presence and then when they become visible devalues their efforts:

I would be on a site as an architectural intern and people would always assume you're the home owner or the wife of the person who's building. For instance I would be carrying a bucket of concrete up to the top of this building, and there was an assumption that it wasn't hard work. Basically they first assume that you're not working, and then they assume that it's easy because a women can do it. And that's unbelievable because this is extremely labour intensive work.

The result is that finished buildings that draw attention for their innovation and design are often implicitly attributed to men. It becomes 'Jim's house' for example, excluding all the work that others, especially women, have put into it. This also reinforces a hierarchy of value of roles in an eco-community that affects all genders. Gardening in particular tended to be contrasted as of less value than building: "the nature within the community of the power that

men have is ‘this is our focus, this is what we’re doing, we’re building’. Whereas if I turn around and go ‘I think it’s just as important to plant food’, sometimes isn’t taken seriously. I think that’s partly a gender thing” (Shelley, Panya Project). The processes through which building became masculinised and the reasons why women concentrated on gardening were often not critically reflected upon:

When we host building courses ... we’ve got a good mix of women and men. I find with the long-term people that live here, the women tend to move more towards the gardens ... whereas the men can just keep cracking at the building, swinging hammers and whatnot, and everyone is invited as much as anyone else in the garden and in the buildings, but it kind of tends to go that way. (Christian, Panya Project)

This process affects men as much as women. For example, in Green Hills (Scotland) the men had to take over the gardening business for a while as both the women were heavily pregnant. One of the men realised that he loved gardening more than building (which he had taken on by default for many years), and has ever since been far more hands-on in the garden.

Making women’s contributions visible has not been easy and there are few spaces of opportunity. Training helps but while “women need opportunity for hands-on training ... there’s a huge amount of discrimination against women in the [architecture] profession and how do you bridge that? ... I think seeing women and just being exposed to it is going to normalize women in the profession. But how you get them in there is a problem” (Alix Henry, eco-architect). Women have benefited from the mutual support of other female builders, but as Kirsten Jacobson (Earthship Biotecture) notes, women eco-builders still do not have high public profiles, but rather support each other in small niches:

I was lucky enough to do it in the context where my neighbour was a woman building her own house, and there were probably three or four women working on the Earthship construction crews at that time, and so to do that somewhere where that's not acceptable or the norm I could imagine being even more difficult ... We're just building stuff out of garbage. It's totally tangible. You see your work. I think that would be especially empowering for women, but how would that translate when they have to go back into a mixed environment. At least they have the chance to gather the knowledge in a place where they're not being overlooked.

Until women become more visible on eco-building sites their diverse contributions are likely to remain undervalued.

Conclusions

This paper has questioned the current practices of architectural design and building in a diverse set of international eco-communities. It has illustrated a disturbing persistence of gender divisions and, perhaps more importantly, a lack of acknowledgement from many involved that such divisions are even problematic. By drawing upon a broad set of case studies, situated in Britain, Argentina, Spain, Thailand and the USA, the commonalities in gender discrimination across cultures and nationalities are even more striking. As such female designers and eco-builders have illustrated how it is productive to find ways of being dissonant other than accepting the Cartesian divisions of gender (Braidotti, 1991).

By focusing on the bodily practices of building it has been possible to identify three spaces of opportunity to change gender relations in eco-communities. First, women designers and eco-

builders have challenged the need for and notion of, ‘strong’ bodies. Second, by focusing on skills, dexterity, learning and practice building becomes rearticulated as a combination of mental and physical skills and competencies that are less associated with a particular gendered body. Finally, women have illustrated the necessity to make their bodies visible in building. For each of these, women have developed strategies to challenge any gender assumption – be that changing building practices (such as making blocks smaller), or running women-only workshops. Such approaches build upon initiatives used in the construction industry more broadly – such as mentoring schemes, internships and attempts to change the sexist culture (Menches and Abraham, 2007; Law, 1989).

A focus on embodiment provides a different starting point from which to examine gender divisions. It enables different questions to be asked as to what it is about women’s bodies that appear to limit their building capacity. Building on existing understandings of the body this approach suggests that women’s leaky bodies, their messiness and sweat might be in part why their inclusion in acts of physical labour is so distasteful (Waitt, *forthcoming*). Or it might be because women’s bodies are not perceived as ‘hard enough’ (just as early explorers had “a ‘hard body’ [which] embodied strength, fortitude and glorified athleticism” [Morin, 2008, 908]).

Yet a focus on bodies also opens up further questions about what bodily capacity women *and* men have and need for labour intensive manual eco-building. In an era of climate change, austerity and rhetoric about community resilience, the need to do more physical work to be self-reliant illustrates the need to more closely examine the body and embodiment to understand environmental alternatives and their possibilities. Crucially, without an explicit feminist analysis of embodiment of these physical practices, these physical practices could just as easily be used to reinforce existing gender identities. Therefore, while a focus on

bodies is important for understanding lived experience and how normalising discourses seek to discipline our bodies, it is also necessary to explore the possibilities of using our bodies in different ways. In other words, it is just as vital to examine how bodily practice can create spaces of opportunity for gender-neutral relations and the anticipated demands upon our bodies in building environmental alternatives. This task requires research on gender and embodiment to start to look forward to the future, and hopefully these examples of eco-architecture and eco-building begin this work.

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Table 1: Summary of case studies (source: author's fieldwork)

Case study	Location	Construction materials	Tenure	Designed and built by	Underlying vision	No. of interviews/ Total no. of residents
Ampersand Sustainable Learning Center	Cerrillos, New Mexico, USA	Straw bale, cob, adobe, wood	Owner-occupied	Owners and volunteers	Autonomous sustainable living	1/2
Casa Tierra	San Francisco del Monte de Oro, Argentina	Clay, straw, wood (cob and adobe)	Owner-occupied	Owners and volunteers	Autonomous sustainable living	2/3
Earthship Biotechture	Taos, New Mexico, USA	Car tyres, waste products, earth	Owner-occupied	Mike Reynolds and owners	Autonomous buildings	4/45
Green Hills	Scotland*	Straw bale, tyres, earth	Owner-occupied	Owners and volunteers	Autonomous sustainable living	4/6
La Ecoaldea Del Minchal	Andalucía, Spain	Wooden zomes	Land collectively owned	Owners and volunteers	Autonomous sustainable living	2/6
Lama Foundation	Taos, New Mexico, USA	Straw bale, cob, adobe, wood	Land owned by trust	Owners and volunteers	Autonomous sustainable and spiritual living	2/15
Panya Project	Chiang Mai province, Thailand	Clay, straw, wood (cob and adobe)	Land owned by founder	Residents and volunteers	Permaculture	4/8
Tinkers Bubble	Somerset, England	Canvas, wood, thatch	Land collectively owned	Residents and volunteers	Living without fossil fuels	4/16

* This is not its true location, but has been moved to protect privacy.

Table 2: Assumptions articulated in the case studies about gender and eco-architecture and eco-building (source: author)

Gender is defined through assumptions about;	Male builders express assumptions by arguing;	Stage of building affected	Implications for self-building
Body	Women are not as strong as men	Practices and process	Strength is required for building, so women less able
Mind	Women are not as good at scientific skills and knowledge	Design and structure	Building is a scientific and engineering project in which women are less able
Society's expectations	Women have not historically been builders and their role is in domestic realm	Occupation	Women's work in building is often unacknowledged and undervalued. Instead their contribution is central in 'making a home'

ⁱ Use of the concept of gender as a way to discuss differences between men and women is itself challenged by understandings of transgendered and intersexed people who do not fit the rigid binary distinctions of women/men and thus transgress gender norms (Doan, 2010).