

INTERVIEW

WITH HENRIETTE H. BIER

With Prof. Kas Oosterhuis' retirement Hyperbody has ceased to exist but Robotic Building continues its legacy. The Robotic Building group builds up on the expertise developed at Hyperbody. The group has 6 members and is led by Prof./Assoc.Prof. Henriette Bier, who established the group as part of Hyperbody in 2014.

by
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What research are you engaging in and how does this impact the future of architecture?

The topic of my research is Robotic Building, which refers to both robotic building processes and robotic buildings that integrate robotic devices. My research is concerned with these two areas and I would say that this research is revolutionizing architecture because buildings are not anymore static and inert but they are starting to become dynamic, adaptive and responsive to user's needs. In addition to this, production processes are robotically driven. These are relatively new developments in architecture, which have been embraced by an international community that is trying to push these developments and bring them to the market. However, the building industry is quite conservative still and slow in picking up these developments.

How do you see the future of parametric design? How could it aid in the situation of extreme growth of population or decline of common wealth?

Well, one of the many advantages of parametric design is that as soon as you define a problem parametrically, the process is data driven and can respond to changing requirements. Without parametric modeling each time a design requires revision the design needs to be remodeled. Needless to say, this is not very efficient. Now, however, when you define the design problem parametrically, you are actually able to revise on the go

and generate several versions. With that being said, I would not necessarily call that parametric design, but rather data driven Design-to-Production and -Operation (D2RP&O) of buildings. D2RP&O allows not only to design and produce but also operate buildings implying the ability to adapt and change/reconfigure to users and environmental needs. Reconfiguration of space is relevant when it comes to urban population growth: For instance, in Asian metropolises several generations often share a very small apartment. In response to these conditions, they have been developing reconfigurable apartments and what we are doing is we add to this manual reconfiguration another layer consisting of robotic or mechatronic devices that allow even children, old or handicapped people to reconfigure the apartment according to their needs. But this is only one of the problems that we are facing. We are also facing many other problems as for instance scarcity and environmental pollution. With the technology that we are developing we are able to introduce new ways of building that are optimized with respect to material and process efficiency. For example material use is minimized through multi-objective optimization procedures and by using sensor actuators, the use of energy is reduced because climate control is then locally implemented meaning that we are not going to heat or ventilate the whole building but only where needed and as needed. These are in short some of the advantages that this technology can bring.

For example projects like Benjamin's (see page 47), proposing inhabitation of structures that are

not in use or soon to be abandoned like oil platforms seem really far in terms of what people expect from architecture. Most people may not like such ideas and may not see this happening; do you think projects like this will be implemented successfully?

Well, I would not know if people would like such ideas. This is just an assumption. I think it depends on how the design is and performs in terms of what it facilitates/ offers to people. Actually some of these abandoned platforms are already in use. There was a CNN story describing the use of such a platform as an alternative hotel for people who want to be away from the busy life for a while without having to be on a boat all the time. On top of that, if you consider overpopulation and rising sea levels, then such ideas present a potential that can be exploited and naturally not only in terms of leisure but also work and living, which in the future will anyhow change dramatically.

Related to that, we and our grandparents were used to being in an orthogonal space with a defined floor, wall and ceiling but for instance in the designs that are developed at Robotic Building formerly known as Hyperbody those limits are very much blurred. How do you respond to people who just reject this way of designing based on their preference for traditional architecture? Presumably, if our children are born into that kind of new environment, that would be

their “normal” and they would be just as comfortable as we are or even maybe more so. How do you respond to people who refuse such ideas?

There are different layers that need to be considered. What we have to be aware of is that architecture has been dependant on the material and technologies that were available. So as soon as, for instance, we started to have reinforced concrete and mechanical production we started of course to have different degree of freedom in terms of architectural expression.

Today, new materials and technologies give even a higher degree of freedom of expression. The only difference is that these developments in previous centuries have been happening much slower so people had time to transit from one phase to another.

In general, all innovations as for instance the introduction of glass in architecture were and are still debatable. Some people would like to and others not to live in a “glasshouse” or in a “concrete bunker” and this is why I think this question cannot be answered in couple of sentences because it implies a cultural dimension in terms of technological developments and acceptance of technology. In my opinion, what is going to be relevant is that certain designs and buildings are going to be more successful because of them being more versatile and/or addressing sustainability and economical aspects. Beauty is going to be not only a question of aesthetics but also a question of ergonomics, efficiency, and comfort. In principle, if you look at orthogonal structures, a lot of space is actually unused. What do you need the corners of the building for? The movement of humans in the space is much more fluent - does not follow grid lines - so I think that research into what human beings really need is extremely important and that has been in many ways neglected.

How do you respond to criticism about computer-aided design and its relation to causing architects and urbanists to feel uncertain about their future role?

As stated by several scientists, technology develops today so fast that we lose the ability to understand it. Our ability to keep pace with it is rather limited which is a problem. And this is why I understand that architects and urbanists may feel uncertain. I understand that this is a threat or it is perceived as a threat but we cannot stop development. From my point of view, we have two options. Either to embrace technological development and go with it, really try to find out what we can do with it in a meaningful way and be a part of how this is going to change our profession or simply stay aside. When standing aside the danger is to become obsolete. Let me put it this way, with technologies like Internet or cell phones and many others, we have witnessed rapid development and we learned to embrace them. The opposite we can't imagine our lives without them. Today if you do not have an email account or a cell phone, you are disconnected. This is why staying in the sideline is not going to be a real option for most of us.

What is your opinion on the position of Robotic Building formerly known as Hyperbody w.r.t education in architecture and design in terms of satisfying the needs of today and shaping the future? Where does Robotic Building f.k.a Hyperbody belong?

I would say that the Robotic Building f.k.a Hyperbody education is very much at the forefront of developments in architecture with respect to the use of new technologies. That is the main focus and the explorations generally are

about finding out the relevance of these technologies for architecture. Because in principle we are confronted with all these technologies and you can do this and that and many more other things so to say but what is the relevance? In which way do these technologies have an impact on architecture? In which way architecture eventually changes fundamentally through these technologies? These are basically the questions we are asking ourselves and this is what we encourage our students to explore, the potential of these technologies in architecture.

Why do you think some academics are less involved in this?

I assume, it is lack of expertise. Often I think that our students are challenged more than most students who go through a more conservative academic approach. Because even developing the required skills to deal with the new technologies is an extra effort and then in addition to that to push and experiment the architectural side. It is a challenge. You have to embrace this challenge, if you want to go with it, otherwise it will be very difficult or even impossible. In principle the way I see it, our students are very dedicated students. They are very inspired and inspiring to me so for me teaching them is a very enjoyable activity.

1. Robotic Building (FKA Hyperbody)
2. Robotic Building (FKA Hyperbody)





How will this approach to architecture impact cities? Could this transform entire regions or countries?

Yes. I have to say I do believe that D2RP&O can have a big impact even in the developing countries. My experience with the students showed me these possibilities. As soon as we started using robots with them, upon graduating they opened their own offices and started to work themselves with robots. Our former students basically became our competitors. For me, this is a confirmation that this technology is embraced by students who have been in touch with this technology and understand its potential. Because this technology frees the architect from the dependency on the contractor. You need material and you need a robot but then you can do what you need to do and not depend on a large industry that is eventually very slow picking up these developments.

To go back to the question, at the moment we are trying to move away from software, at least in certain areas, that is proprietary, and use open source. This could make our technology accessible to everybody. Whenever I visit developing countries my observation is that the Western world is exporting technology that is outdated, we

know it does not work, and that makes these countries dependant on import of materials such as cement, etc. While these countries have their own materials, they have their own ways of building. At the moment the university sends old computers to Africa and I was proposing to send not only refurbished computers but also robots and introduce them to these technologies, encourage them to become their own constructors and using their own autochthon ways of engaging with buildings and building construction. I think this migration happening at the moment is exactly a response to the fact that western part of the world or the developed part of the world is often disrespectful towards what these people can do. So what is essential right now is to have a more respectful and more embracing attitude towards what they can do and instead of putting a way of building in front of them that we have been exercising in the past and making them dependant we should rather think of how they can be empowered to do what they want to do and thus make them independent and able to act on their own.

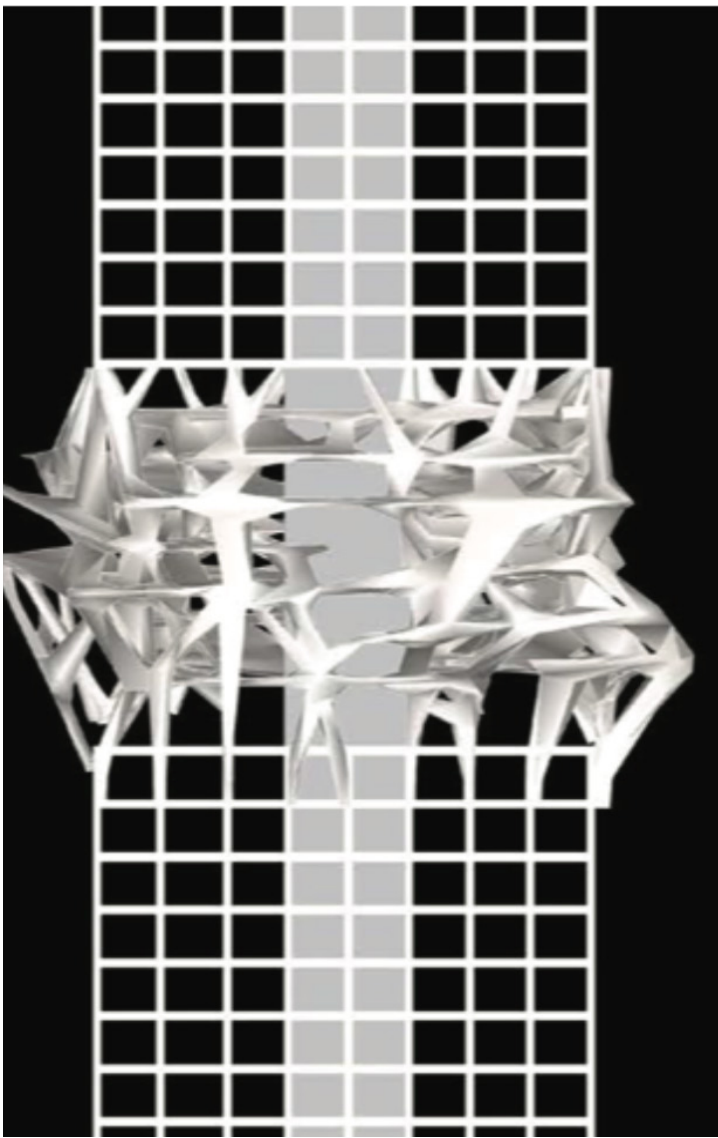
What may be the influence on people's social life and social structure? Do you think these developments in technology will result in a more of a borderless

society throughout the world based on similar ways of building or the borders will still be there but in a more differently constructed way?

I think that this technology is empowering. I feel that the technology is not going to be expensive in the future I think the whole economy is going to change and we are going to become more and more producers, not consumers. These technologies allow/empower us to become producers. I often think that the D2RP&O system that we develop now will become accessible to everybody and people will be able to get/rent some robots, modify a parametric model on the Internet to fit their needs and start to build.

So an average person will become a designer, programmer or as what you have said, a producer?

I do not think that average people are going to need a lot of programming in the future I have to say. In the last 10 years everything became more and more user friendly. My observation is that the students who start with us in masters-1 and continue all the way through graduation become experts; easily surpassing previous generation who surpassed their precedents, which is amazing to see. It goes fast and I assume that what at the moment seems



still difficult is going to be easy in a short while. Even if you think of the cumbersome way you would have to program cell phones in earlier times today a child can do that. My 11-year-old-daughter is already using programming tools to program behaviors of figures interacting with each other in self-created movies involving virtual characters.

This also gives a little insight into the question of what we will do as architects and urbanists, because there is also the concern of losing control as the programs are doing everything?

I do not think losing control is of concern because you would not say when you have a pencil in your hand that you lose control just because the pencil or the brush are doing certain kind of lines or strokes. You know what the pencil can do that for you, just like the way you know what a brush can do for you. These are instruments. The same goes for computer programs. They can do certain things for you but they are not going to be able to do everything or for that matter anything without you. You are going to use your pencil, your brush,

your computer program or whatever you need to achieve something that otherwise would not have been possible to achieve. If you use only pencil and ink to design a building, there are certain constraints and if you use computer software of some sort you still have them but on a completely different scale. I also say that from the perspective of the time I was a student. When I was studying we were using pencils and ink pens. Little computer programs that we were experimenting with they did actually just do the same like you could do manually. The only difference was that if you wanted to correct something you did not have to use the physical eraser but the virtual one. In principle they were exactly the same. While now, processes are helping you to find answers to certain questions or develop alternative designs, etc. The computer is just a tool. It has constraints, limitations and potentials.

What do you think are the most exciting implementations right now? What are you looking forward to working on?

What the next step for us is looking into human-robot collaboration.

How is that different from HRI (Human-Robot Interaction)?

Well it is different in the sense that you need to identify what tasks are better and more easily implemented by humans versus what tasks are better implemented by robots and then develop a choreography of interaction that will accomplish a task. And we are researching into it now as HRC is going to be the next step.■



3. Robotic Building (FKA Hyperbody)
4. Robotic Building (FKA Hyperbody)