CANADIAN ARCHITECT

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ECO-EFFICIENCY

MICHAEL ELKEN

25

25 STANDING TALL

In Vancouver, Acton Ostry Architects has completed the world's tallest mass-timber building at the University of British Columbia. **TEXT** Courtney Healey

30 DOUGLAS CARDINAL

In advance of his installation at this year's Venice Biennale, the venerated Dene architect sits down with Canadian Architect to talk about life, architecture and Indigenous identity.

34 RAW MOMENTS

Recycled, redesigned and rebuilt every year, a series of pop-up restaurants created by an entrepreneurial design team warms up Manitoba's winter landscape. **TEXT** Lawrence Bird

SIMEON RUSNAK

34

COVER RAW:almond, on the frozen Winnipeg riverfront, one of a series of recycled temporary wintertime restaurants built around Manitoba. Photo by Simeon Rusnak.

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THE NATIONAL REVIEW OF DESIGN AND PRACTICE / THE OFFICIAL MAGAZINE OF THE RAIC

THE NEXT GREEN: REPORT FROM DENMARK

PRIX DE ROME RESEARCH AND DISCOVERIES FROM DUBBELDAM ARCHITECTURE + DESIGN

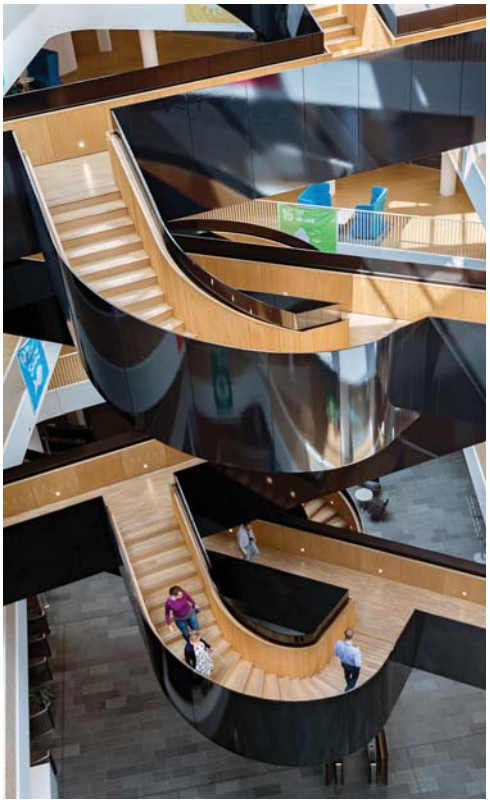
TEXT Heather Dubbeldam and Joseph Villahermosa
PHOTOS Heather Dubbeldam, Andrew Snow

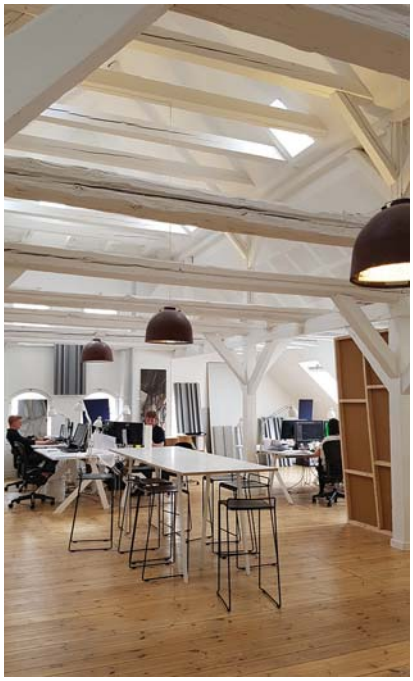
Copenhagen, June 2017. As we descend into the bowels of the United Nations City building to view its sea water cooling system, we are impressed by the immense network of pipes (some as large as two feet in diameter) that form a complex labyrinth beneath the building. "We find ways to use what is available, use existing resources like sea water to create new efficiencies in our buildings," says Jack Renteria of 3XN Architects, the firm that designed the building. As our tour guide, Jack offers us a rare glimpse not often granted to the public of the innovative cooling system. It's interesting to hear his comments: Jack is Canadian, and having lived in Denmark for several years, he's adopted the signature Scandinavian mindset of resourcefulness.

United Nations City is the first of many highly sustainable buildings that our office team visits on our trip to Copenhagen, the first leg of our Professional Prix de Rome research project, "The Next Green: Innovation in Sustainability Through Design." As well as Denmark, the project will also take us to Sweden, Norway and Germany for first-hand study of sustainable precedents for northern climates. We are exploring how architects in these countries are setting new standards for buildings that surpass current protocols for sustainability, without compromising design excellence. We hope to share how these building-integrated sustainable solutions generate a unique spatial and artistic architectural language, one in which energy efficiency and design merge seamlessly.

Our next stop in the UN building is the roof and its views of the surrounding harbour, where an expansive array of photovoltaic panels—more than 1,400 of them—generate almost 300,000 kilowatt hours per year, enough to supply most of the annual demand for the building.

ABOVE LEFT Heather Dubbeldam, Joseph Villahermosa (centre) and Vandkunsten partner Thomas Nybo Rasmussen, at the office of Vandkunsten Architects in Copenhagen. **ABOVE RIGHT** UN City by 3XN unites eight agencies under one roof in one of Denmark's most energy-efficient buildings. **CENTRE** One of many sustainable measures: a seawater cooling system. **RIGHT** The sculptural atrium staircase connects floors on all levels, fostering inter-agency communication.





Although this is a sustainable system that is "applied" to the building, there are many others that are created through an architectural response, including a central atrium with a sculptural staircase connected to bridges across multiple floors (allowing for chance interactions), which is illuminated by immense operable skylights for natural ventilation at the heart of the building. Meanwhile, on the façade, a specially developed shading system reacts automatically to sunlight, providing optimal lighting conditions for those working within.

As a visit to 3XN's office reveals, and as would prove true throughout our travels, Denmark and other Nordic countries are at the forefront of sustainable design in research, urban planning and architecture. Historically, these countries have been early adopters of many sustainable initiatives and standards, and their governments have made a substantial investment in dedicated research, motivated by high energy costs in northern climates. Numerous architecture practices in these regions operate government-funded research divisions within their practices, supported by Realdania and other organizations that investigate sustainable materials and technologies, integrating them into their projects and paving the way for the next generation of sustainable architecture. 3XN's research branch is called GXN; the "G" stands for "green." The GXN team develops a variety of innovative systems and materials, while Henning Larsen (another prominent Danish firm) has a research division with a slew of PhD students for this specific purpose. "The whole research program came about as a reaction to our engineers saying 'No' to everything," says Louis Becker, who is a partner and design principal at Henning Larsen. "That's when we started building our own team of experts in energy performance, to challenge these assumptions and use this knowledge in our projects."

We visited Henning Larsen's offices as well, to learn about Copenhagen's "Climate Quarter" and how they are refurbishing old buildings from the outside to make them more energy efficient—all while tenants continue to occupy their homes. This is just one effort among many to address the challenges of a changing climate. Danish architects are preoccupied with resiliency, in terms of how our built environment can evolve and react.

Denmark has been experiencing "cloudbursts"—extreme rain incidents—which we have also encountered in Toronto and other Canadian cities in recent years. Flemming Rafn Thomsen, principal at Tredje Natur, a multi-disciplinary landscape architecture firm, showed us various proposals for new "climate" neighbourhoods, sidewalks, and public spaces that are being replanned to mitigate flooding, with green and natural means of water diversion. This is achieved though swales and ponds that double as parks and play areas.

"Nature seems untouched, in balance," Flemming explains, "but in reality its an aggressively restorative practice, making something out of nothing." As a result, many asphalt roads and sidewalks are being replaced with permeable pavers, softscaping and permeable walking paths. New developments incorporate a focus on water as a positive force that is being harnessed rather than one that creates damage.

Another day trip finds us gliding along the highway in a Tesla driven by Michael Christensen of Christensen & Co Architects, up to the Lyngby campus of the Technical University of Denmark (DTU). Among the buildings that we visit is DTU Compute, which houses the Department of Applied Mathematics and Computer Science. It is an incredible light-filled space, an unexpected experience given the rather sombre appearance of other buildings on campus. Live trees planted in-ground grow and thrive throughout the various student study areas, blurring the division between inside and outside and contributing to the quality of indoor air. The indoor trees are monitored remotely by experts in The Netherlands. Although there was some initial concern when their leaves started dropping shortly after planting, the experts remotely adjusted the fertilizer formula, ensuring that the trees would continue to thrive.

However, environmental considerations in Denmark seem to take a backseat. "Now a major consideration is how we can make buildings that influence society in a positive way," Michael tells us. "It's the most important thing because urban societies are becoming more dense and cultures are mixing. It's much more important than cutting a kilowatt hour or two on energy consumption. How do we make people shake hands, meet, fall in love? You have to provide opportunities for people to have a conversation that leads to the Nobel Prize in ten years. A building, in a very pragmatic way, is shaping the way people work, the way they learn, the way they live."

OPPOSITE Left to right: The light-filled interior of DTU Compute, complete with indoor trees; AART's office set in a refurbished industrial attic; 3XN's office in a former "gunboat shed" facing an inlet.
LEFT Material research by GXN, part of the firm's systemic examination of biological matter used to research future building construction.
BELOW Bicycles parked outside Nørreport station, the busiest rail station in Denmark.

While our research focus is environmental sutainability, we are surprised to discover that in Denmark social and cultural sustainability are prioritized. Environmental sustainability in architecture is a given: building codes are so stringent and sustainability has been such an integral part of Danish architects' approach for so long that they don't focus on it or talk about it. From the work of pioneering architects like Jan Gehl, architecture is centred on people: how they inhabit and move through buildings, public spaces and cities. Rather than seeing architecture as material production, Danish architects focus on quality of life and how it can be positively affected by the built environment. We see an emphasis on multi-unit residential developments that are culturally and socially sustainable: designed to accommodate different demographic groups, including families, over the longer term by providing access to private outdoor living spaces. There is also a focus on making architecture accessible and understandable, physically and socially, by anyone, so that children, single people, families, retired people or people who are less able can be involved in architecture in a more profound way. These notions were exemplified in the work of AART Architects, where Rasmus Højkjær Larsen, associate partner and the head of AART's Copenhagen office, showed us how they respond to these emerging concerns. Their Musholm project is currently one of the world's most accessible buildings: it's a resort for people with severe physical disabilities to enjoy with their families.

Between visits to architects' studios in amazing old buildings, we also trek to the more officious headquarters of research institutions and government organizations that support and promote sustainable architecture, such as Realdania, the State of Green and the Danish Architecture Centre. We observe that Denmark's goal to be completely fossil-fuel free by 2050 has profoundly impacted the building industry and the people. We sense a feeling of optimism and responsibility, as well as a shared ambition to consume less energy and drive innovation in the construction/energy sector. Building codes for energy consumption are extremely stringent but Danish architects meet and surpass those standards as a matter of course. Some of the mid-size commercial and institutional projects that we tour consume less electricity than the average North American single-family home, using a combination of passive and active systems and approaches, which leaves us feeling that we could achieve this in a more widespread way in Canada.

Throughout our exploration of Copenhagen, one thing remained constant: the veritable *sea* of bicycles. Forty percent of the population cycles to work year-round, and with the tide of bicycle commuters peaking during rush hours, the presence of the bicycle was perhaps the strongest reminder that this was very different from not only our home town of Toronto, but of Canada itself. Culturally we are different from Scandinavians, but does this mean that in Canada we are not able to reconsider our methods of building, of designing in a manner that encompasses sustainability in all senses of the word? We see more examples of environmentally and socially sustainable buildings being built, but they are still few and far between. We need a major culture shift, toward urban centres and developments that position people's health and long-term well being at the forefront.

And now that we are back at our Toronto studio, we hope that sharing these precedents and approaches from abroad will help to spark further discussion and stimulate change. We look forward to sharing more insights as our research continues.

Heather Dubbeldam, FRAIC is the founder and principal of Dubbeldam Architecture + Design in Toronto. Joseph Villahermosa is the firm's marketing and research director.