

THE NEW EUROPEAN BAUHAUS

A HUMAN-DIGITAL PLEA FOR A SUSTAINABLE BUILT ENVIRONMENT

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I'm an architect, professor at the Faculty of Architecture at the University of Porto (FAUP), and a European citizen. It is with great honor and pleasure that I come to share some thoughts on the **New European Bauhaus** movement and my possible contributions to its debate and operationalization.

Let me start by a foundational coincidence. Like 100 years ago the crisis caused by the WWI framed the rise of Bauhaus, today, the current environmental and economic crisis that Europe and the World are going through presents a decisive opportunity to rethink and project our common future. In this context, the New European Bauhaus movement launched by President Ursula von der Leyen **represents a bold and inspiring vision for an urgent change**, which has to bypass nostalgia and become a **transformative action**.

The **challenges we face today are of unprecedented complexity and scale**. Climate change represents a global threat to the existence of all human beings without exception. Furthermore, its interconnection with other problems, such as economic, demographic or health ones, like the current covid-19 pandemic, is drawing the perfect storm. Facing these threats requires global and coordinated action from superior authorities. By aiming to reduce CO2 emissions by 55% by 2030 and to achieve climate neutrality by 2050, I greet **the European Union for assuming such brave responsibility and for taking the leadership**.

So, where should we focus? When discretizing the problem, we verify that **buildings and the related industry** are one of its epicenters. Being responsible for approximately 40% of energy consumption and 36% of emissions in Europe, the design of our built environment must occur in a different way. Buildings should not be thought as autonomous objects but as agents belonging to a global symbiotic ecosystem. The industry has thus to adopt the most recent concepts of sustainable design, such as **regenerative design and circular economy**. The goal is not just to maintain the environment, but to produce a positive effect on it.

However, the EC President's **strategic vision** go further by urging that this transformation "must be more than an economic and environmental project" to be also, above all, "**a new cultural project for Europe**". It is inevitable to find resemblances between this appeal and the spirit of Bauhaus. Just as then, there is a brave ambition to unveil the defining aesthetics of the epoch, which should nowadays "blend design and sustainability". For that, we need an **holistic stance**, through the **union of different knowledge and skills** and using **design as a tool for change**.

But this action is inseparable from the interference of **technology**. In the past, the **Machine age** paved the way to mass-production logics, which came to shape the industry, the arts and the society then. Today, the **Digital age** is operating a non-less radical transformation of our world. The extraordinary advances that have occurred in the last decade, for instance, at the level of artificial intelligence, big data, cloud computing, blockchain, IoT, digital fabrication, virtual simulation or robotics, have blended the physical, biological and digital systems of information, communication and production. Living in the age of the smartphone, social networks, mass-customization, 3D printing, self-driving cars, GPS, online work and services, we have to embrace technology to address the New European Bauhaus movement and, at a broader scale, the 2030 UN agenda for sustainable development.

It's now time to talk about the **agents of change**. Due to their holistic *modus operandi* and a particular set of skills, **architects** should play a central role in the EC initiative. As creators of the biggest objects on earth -buildings-, they have the greatest power and responsibility in shaping their impact in the environment. However, designing a building is not an ordinary assembly of materials to provide shelter, neither it is a single-objective optimization problem. Instead, architects have to gather, discuss and combine knowledge from other disciplines, such as engineering, anthropology, economics, history, politics, technology or the arts. Then, through design thinking and practice, they have to imagine, develop and build solutions that demonstrate an exceptional performance in all of those criteria. Following Walter Gropius' strategy, architects should be called again to help orchestrating an **organic collaboration between different agents and disciplines** in order to fulfil the aspirations of the New European Bauhaus.

As an architect, with a long-time dedication to the theory and practice of digital technologies in various places, I believe we cannot just passively watch the **digital transformation of the building industry** taking place. If we want to meet the aspirations and goals of the New European Bauhaus movement, we have to discuss, orient, support and monitor that change.

With that in mind, I would like to highlight and comment on **5 themes** that, among others, and as a whole, would establish the necessary conditions to regenerate our built environment:

- **Design** - Computational design and AI, can assist the generation and optimization of design solutions in ways that we, alone, couldn't take. Digital simulation processes can measure material and building performance from many different criteria (e.g., structural, thermal, acoustic or daylight). Digital fabrication and robotics are supporting flexible and customized modes of production. With the help of virtual and augmented reality these design tasks can be experienced in novel ways. This interactive partnership with the digital should not be seen as a threat but as an opportunity to empower our capabilities as both creative and responsible designers.
- **Collaboration** - Overcoming traditional linear design processes, computational and BIM methodologies are paving the conditions to reach true disciplinary collaboration. By fostering the creative contribution of specialists through their early involvement with the architect's intentions, environmental concerns with aesthetic ones can spontaneously be merged. This condition can go even further by including modes of assessing the life cycle of buildings and materials and, ultimately, exploring digital twins.
- **Production** – Fabrication and construction have to take advantage of both industrial and crafts modes of production. While the former is essential to provide rapid, flexible and economical responses for new construction demands, the latter is important to address the singular challenges of existing buildings regeneration. Rethinking prefabrication, on-site construction, and human-machine/robot collaboration in the scope of the current industry 4.0 are some key topics to be further elaborated.
- **Materiality** – We have to revert Bauhaus' appeal for synthetic materials like concrete and steel, and encourage the return to natural materials, like timber, cork and natural fibers, or to the engineering of new synthetic but ecological ones. Capable of embedding geometric and physical properties, digital models can support material expression as well as the optimization of its supply, performance and production. In parallel, physical computing, IoT and big data technologies can open another innovation strand, where smart material systems can sense and respond to the surrounding environment.
- **Aesthetics** – The eco-design trends have balanced between organic and high-tech stereotypes, and passive and active techniques. By reminding that different regions would require specific solutions (e.g. North vs. South), we should question if the new aesthetics should be a visible

statement, or more of an invisible feature. Also, if revolutions introduced new building typologies, like the factory, the greenhouse or the train stations in the industrial revolution, what will be the typologies that will culturally define our time? On this matter, I wish to believe that the huge buildings without human presence of the datacenters and automated logistic warehouses won't remain as the unique answers.

My contribution can also extend to the help with the thinking about **strategic actions** at, for instance, the academic, research, practice, entrepreneurship or dissemination levels.

We have to think globally but we will have to act locally too. The New European Bauhaus should be diverse and inclusive, taking into account the contributions and realities of different regions.

Therefore, I would like to acknowledge the relevance of the **local contexts** in which I am involved - the FAUP, University of Porto and, my country, Portugal. I will do that through the example of Álvaro Siza and Souto de Moura, two Pritzker Prize architects from Porto, who combine tradition and modernity in a unique way. In their Portuguese Pavilion for the Expo 2000, they rethought the use of cork, a natural and recyclable material, by proposing its use, for the first time, as an exterior facade material. Collaborating with engineers, contractors and material producers, they opened a new aesthetic avenue, which, simultaneously, could solve thermal and acoustic insulation, thus allowing for energy savings. Furthermore, cork was also recycled in a cementitious mixture that provided a lighter and softer pavement. Finally, this building was also designed for disassembly and, after this temporary exhibition, it was rebuilt to Coimbra where it stays functional since then.

Concluding with this inspirational case, I would like to thank you for your time.

I hope we can collectively start designing the sustainable future of our built environment soon!

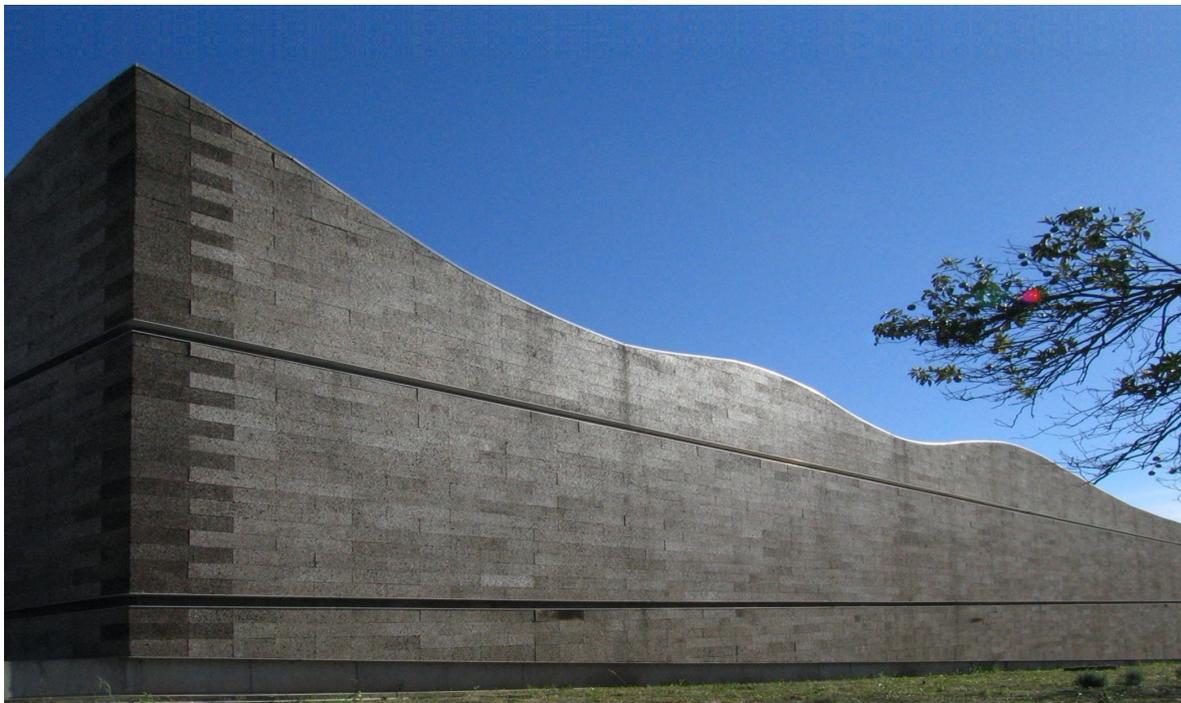
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Harvesting cork

Unlike wood, it does not kill the tree. The cork tree *-sobreiro-* can thus continue producing cork throughout its life. The main industrial application is in the production of cork-stoppers, and the wasted material is used to manufacture subproducts. The expanded cork agglomerate (ICB) is one of them. It results from a grinding and boiling process that creates 100% natural cork blocks suitable for the building construction industry. *(photo: Bent&Bree)*



The Portuguese Pavilion – Expo 2000

Designed by Álvaro Siza and Souto de Moura, this is the first building where cork was used as an external facade material. This option introduced a new aesthetic while solved different performative requirements at the same time, that are usually solved by a layered assembly of different materials. *(photo: DFL/FAUP)*



Digital design and fabrication research

The Digital Fabrication Laboratory (DFL) at FAUP is the research group that I coordinate and that explores the impact of digital technologies in architecture. One of the research avenues explored by the DFL is focused on examining the possibility for new applications of traditional materials in building construction. *(image + photo: DFL/FAUP)*



Research by Design

The DFL/FAUP has developed extensive research on cork. Besides pushing forward its aesthetic possibilities, we have also examined the possibility to combine with other materials to create new building systems. The CorkCrete Arch above at FAUP (2015), is prototype that explored the combination of cork with a fiber reinforced concrete. *(photo: DFL/FAUP)*

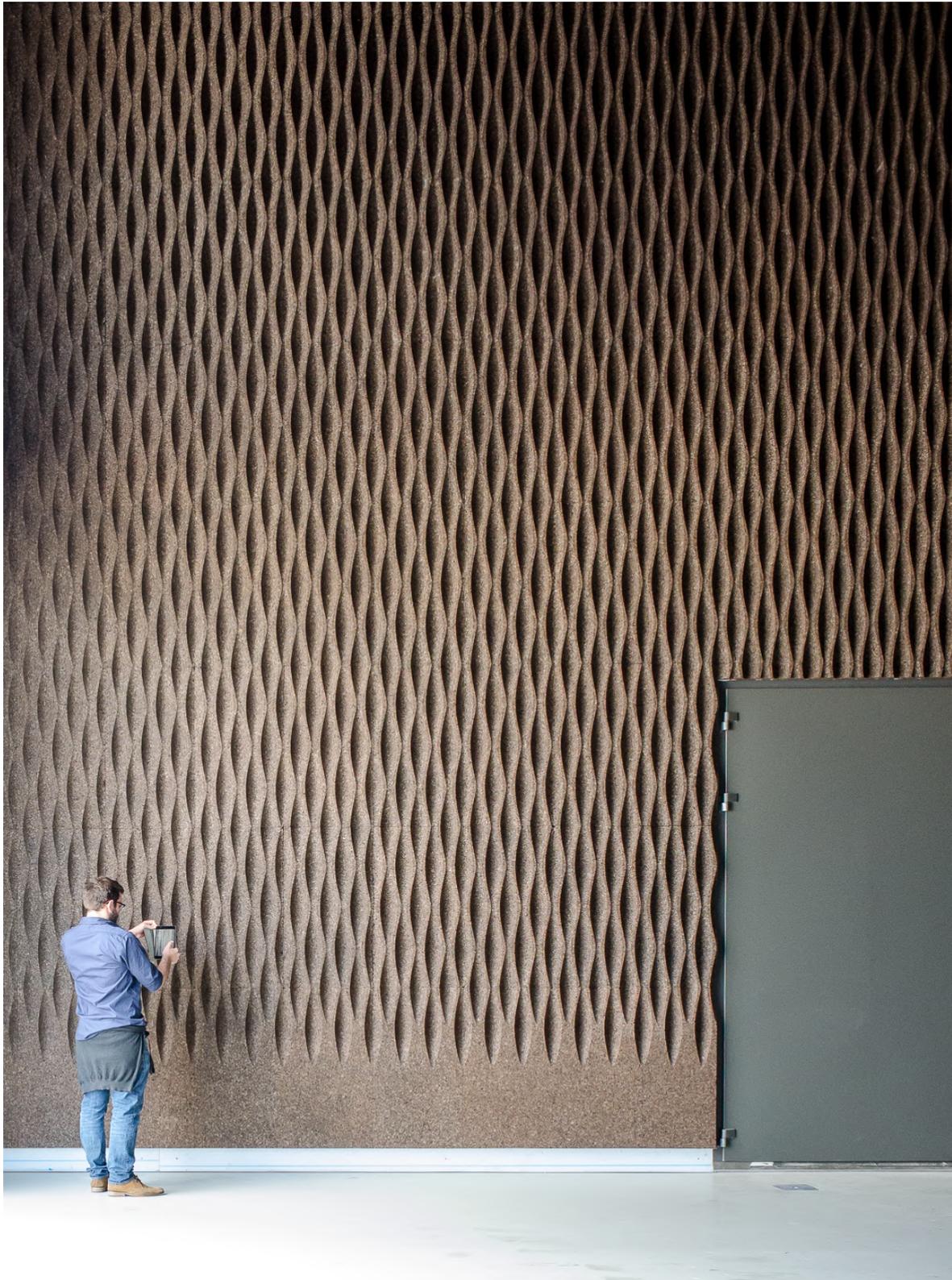


Pilot Projects

To explore in a more comprehensive way certain research avenues, the DFL/FAUP has designed and build exhibition pavilions to test and evaluate specific research topics.

In the top: the Cork Vault Pavilion (2013) researching the structural possibilities of cork. *(photo: João Morgado)*

In the bottom: the CorkGraphy Pavilion (2017) testing acoustic and volumetric expressions of cork. *(photo: DFL/FAUP)*



Research Application

Designed by the DFL/FAUP in Coimbra (2015), this cork facade explored some of the aesthetic possibilities enabled by the use of digital design and fabrication processes. *(photo: Luis Antunes)*



Dissemination

From Álvaro Siza and Souto Moura pioneering work using cork in the exterior of buildings, many other architects and designers have started exploring this innovative and sustainable solution across all continents in the world.

In the top: the Cork Screw House by Rundzwei Architekten in Berlin (2019). *(photo: Gui Rebelo)*

In the bottom: the Serpentine Gallery Pavilion in London by Herzog and de Meuron (2012). *(photo: Iwan Baan)*