

# Space, technologies, architecture, and investors

*„From time immemorial,  
public space has been a central  
theme of architecture.“*

In December 2019, the coronavirus SARS-CoV-2, which we assume originated in Wu-Chan, China, may have jumped on humans from a bat, badger or snake, or even escaped from a laboratory. By March of the following year, it was spreading throughout all continents except Antarctica. During the spring of 2020, most countries in the wealthy north thought cautiously that the epidemic was over; autumn has convicted them of error: the daily increments of both infected and dead are even higher than in the first wave - in many cases by order of magnitude. And experts expect further waves of the pandemic. Quarantine measures against the spread of the disease are back and many states are closing down businesses and clearing public space again. And the people are richer in the experience of *lockdown*: the „home office“ for them is no more (unlike at the beginning of spring when restrictions on movement were placed upon the public) a paid vacation, but a house arrest. All this exacerbates the demanding care for the education of their children imposed on them by the closure of primary schools and distance learning. As soon as they have recovered from the psychological and psychosocial problems caused by the spring restrictions on movement, their physical public space is closing once again. The spring experience intensifies fears and longing for meeting friends in a garden or in a restaurant, playing team sports and recreational activities, or visiting theaters and exhibitions. Physical public space that seemed to lose out for a long time in the competition of information and communication technologies suddenly proves to be essential and indispensable.

Let us recall what public space is and how fundamentally it differs from a public area: those who do not need an explanation will kindly skip this one and the following four paragraphs. Public space is a platform of communication in the context of a settlement structure - cities in particular: it is a platform of social, cultural, and socio-cultural communication, and certainly also the communication of material goods. Virtual public space is a space of media: today it includes the press, radio, and television, magazines, books, film, publicly distributed digital carriers of word, music, and image, and the Internet and its various products. Urban public space that includes streets, squares, parks, roads, but also markets and public buildings for example, is a historical, contemporary, and probably also a future platform for communication between different parts of settlements - and between people, communities, and society.

A public-accessible place is not yet a public space and not every public space is an open-air place. People make the difference together with the open sky. Public space is a platform of interpersonal communication - *communicative dealing*<sup>1</sup>

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<sup>1</sup> Habermas, J.: *Theorie des kommunikativen Handelns*. Frankfurt am Main: Campus 1981, ISBN 3-518-28775-3.

by Jürgen Habermas; (today), it includes civic communicative action, which shapes social relations, values, and attitudes and also contributes to the formation of the culture of society. Such a public space is represented by Steiner's *European cafés*<sup>2</sup> - places where people conspire, write and debate, and where great philosophies, artistic movements, and ideological and aesthetic revolutions were born. Instrumental communication, on the other hand, is closer to McLuhan's concept of the media *extensions of Man*: it involves communication that relates to his material needs - advertising is an example.

From an economic point of view, public space is public but also a mixed estate, whose various forms fulfill the basic human need for communication. It is located in the open air as well as inside buildings: they are all places, all spaces actively sought and visited by people to be in them or through them involved in communication with the *world of their existence*<sup>3</sup>: parks and planned and occasional meetings in them, shopping streets, theaters and cinemas, pubs...

Finally, the delivery supply and infrastructure media are a part of the communication in public space. More important than its material nature and content is the socio-cultural contribution of urban infrastructure. As an example, a functioning urban sewerage system is a hygienic prerequisite for urban concentration, which contributes to economic and cultural development, and electricity is a source of electric lighting that prolongs the time to perform manual work - and also to provide intellectual performance<sup>4</sup>.

Public space, on the other hand, is an undeveloped place of a settlement unit, unless its use is reserved for private purposes. A place accessible to the public becomes public space to the extent that people personally use it. The difference is given with regard to man and society, if and to what extent it was successfully applied in the creation of the public space.

Public space seems to be returning to the top of the list of socio-cultural values that it has occupied since humans started developing cities. Since the beginning, public space has been the central theme of architecture: the pyramids formed the physical public space of Egyptian necropolises, the Egyptian and ancient temples were public space as well as theaters, churches, and stoy, the public space was the aristocratic mansions of the Middle Ages - the administration of manors.

<sup>2</sup> Steiner, G.: *The Gifford Lectures: George Steiner*. [www.giffordlectures.org](http://www.giffordlectures.org). retrieved Feb 4, 2020.

<sup>3</sup> Heidegger, M.: *Sein und Zeit*. Tübingen: Max Niemeyer Verlag 2006, ISBN 3-484-70153-6.

<sup>4</sup> Sourek, M.: From Functional Areas towards Structure of Public Space: Sustainable Development of City in Context of Social-Cultural Values' Communication. *Advanced Engineering Forum*. Trans Tech Publications 2014. vol. 12, pp 176-180, doi: 10.4028/www.scientific.net/AEF.12.176.



Urban public space, including streets, squares, parks, roads, but also stoy, market, public buildings and many other spatial and functional variants, is historical, contemporary, and all indications are that the future platform for communication between different parts of the settlement - and between people, individual sections of the community and society with each other.



Public space itself is not a public space, and not every public space is a public space. People make a difference - and the open sky.



The public space was also the maashouses of burgher houses and „salons“ of private residences of entrepreneurs of *the long 19th century*, not to mention parks and boulevards built in the same era. After the famous and at the same time unfortunate episode of Giedion's modernism, architecture gave up its social role and lost sight of public space, which in the future was to be replaced by free places; together with the public space, the architecture itself found itself on the siding. In the seclusion of architects' attention, the physical public space remained until very recently; the public underestimated it, took it for granted, and valued it little (as it happens to goods accessible to everybody without restriction - let's remember the fairy tale Salt over Gold). The last nail in the coffin of physical public space seemed to be the advent and development of social networks and information and communication technologies in general.

The renewed interest in physical public space is partially affected by the coronavirus crisis. The interest in vitality and the residential, „human“ qualities of urban public spaces has woken up since the 1980s: initially only timidly and unsystematically, because intuitively, but still. Until recently, it was a matter of civic initiatives rather than the professional interest of architects: most architects, who have based their professional and general reputation and business success on the humanization of public spaces, are somewhat activists. Coronavirus has shown strength and the fundamental importance of public space, but especially to both nonprofessionals - users in general - and architects, it has shown what in theory has developed only a narrow academic sphere: it has pointed out that physical public space are not only free spaces but also - in particular, most often - various types of spaces in buildings - no matter whether public or private ones. The key is whether the public enters them and acts communicatively there. The cafes (so typical to Europe), and theaters, shops, galleries are some examples. On the other side of the scale, the domesticated landscape (again so typical for Europe) is public space, too.

*The covid\_19 pandemic, among other things, made urban public space visible: it was not until the lockdown took it away from us that we realized how much it meant to us. This is a chance for architecture, relentlessly relegated to the sidelines since the 1950s precisely because it has betrayed its mission to shape public space. Simultaneously, a virtual public space mastered by information and communication technologies offers a virtual or augmented reality environment for practical use. The fundamentally spatial and communicative nature of architecture meets with a historic opportunity to change the paradigm of the process of its origin in this environment: in a virtual reality environment perhaps finally, instead of creating images of architecture, architects will be able to create archi-*



The resurgence of interest in physical public space is and is not related to the coronavirus crisis.



From time immemorial, public space has been a central theme of architecture.



*texture directly - to create virtual twins of future architectures respectively. In this situation of renewed awareness of the values of physical public space, a circle is closing: virtual public space, which began to split off from urban public space six thousand years ago, is ready to provide an environment in which architectural ideas will develop in unprecedented ways - immediately, easily, with higher productivity and higher quality of its materialized form - part of the built environment.*



The covid\_19 pandemic, among other things, made urban public space visible: it was not until the lockdown took it away from us that we realized how much it meant to us.



# An opportunity for public space, for architecture, and for investors

*„Continuous investment  
in technology development  
is the most realistic feasible  
option for implementing  
a sustainable future project.“*

*The need to cope with the covid\_19 epidemic has created a unique opportunity to capture in a truly comprehensive way the three pillars of sustainable development - the environment, social structures, and cultural capital of society (including its economy). This opportunity has been traditionally associated with the environment or climate change. One of the pillars without the other two, however, as it is known, does not work. The physical public space binds together the social, the socio-cultural, and the environmental „pillars“, in all three „pillars“, architecture has its roots. The opportunity to grasp the new, fundamentally more productive themes of architecture and physical public space has received only marginal if any, attention so far, but it is set in a robust context of sustainable development and apparently, it is a mistake to ignore or downplay it.*

*The opportunity can be seized, missed, or even misused. One, the second or the third trajectory is driven by demand, implementation know-how, and technology; last but not least, it is driven by the interest of investors - the interest in investing in the development and production of products that will address (and also encourage) demand: this is forgotten often in connection with architecture.*

The restrictions on the movement of people in the quarantine measures against covid\_19 further encourage the demand for public space. Architecture has begun to orient itself, although it is still turning its attention to public space intuitively, opportunistically - to bite the pie that civic initiatives and public administrations bake, seeking an alibi in participatory public involvement in the preparation of development projects.

Technologies would be, too - but their potential is still beyond the horizon. Architecture is still blind to the opportunities offered by virtual public space, equipped with virtual and augmented reality technologies. Neither popular visualizations nor virtual reality used to support the sale of development projects refutes the statement: what is still missing is the direct use of virtual or augmented reality in the creative process of architectural design. An opportunity for public space, for architecture, and investors.

The trend of practical action to avert or at least mitigate climate change - practical action „to save the planet“ is proving more prompt. The pandemic of covid\_19 eliminated neither Greta Thunberg nor the Extinction Rebellion but relegated them to the sidelines when it took their basic technology - popular mass gatherings in public space - away from them: the topic of climate change proved to be abstract and less urgent in competition with the global struggle to save lives attacked by the coronavirus. Moreover, European governments are overwhel-

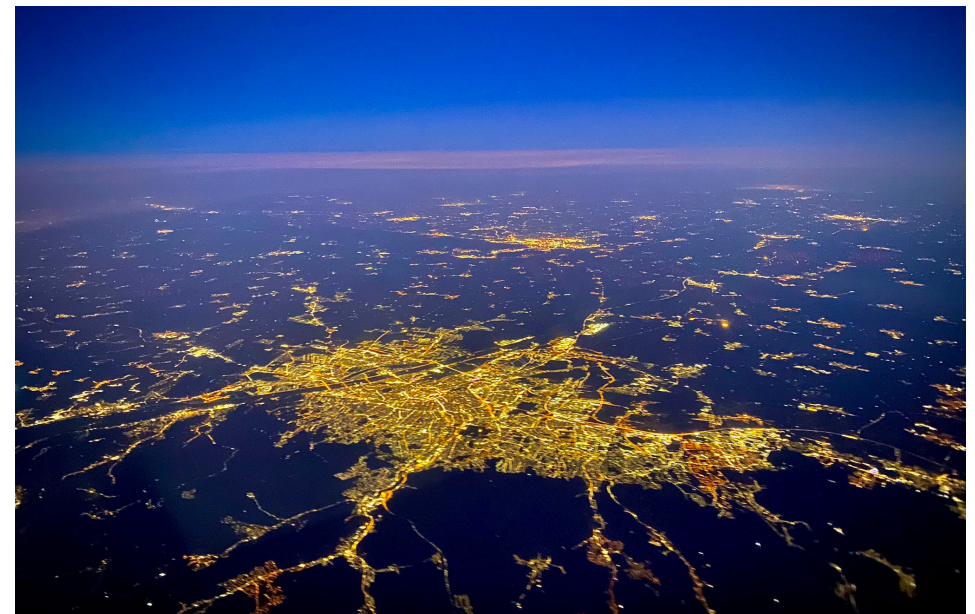
mingly committing themselves in the meantime to achieve carbon neutrality in a shorter or even shorter time: the easy enemy by definition defenseless against civic initiatives has lost its marketing value. Unprecedented declines in CO2 emissions by industry and transport, drastically reduced as part of quarantine measures, also play a role. And when President Xi Jinping announced at the UN General Assembly in September 2020 that China would begin to reduce its emissions after 2030 and achieve carbon neutrality in 2060, there remained no one to demonstrate against, no one to question „How dare you?!“

On the fringes of popular debate and media interest, all the more vigorous opportunities to respond to climate change are understood by start-ups - in California, Finland, and around the world. In the 1990s, the *dot.com bubble* changed our lives and the world economy forever. It did not go without crashes and unfulfilled expectations - financial ones primarily. On the other hand, this revolution passed without both government support and demonstrations. The past decade went in the spirit of the passion for renewable and cleaner, preferably *zero-emission* energy sources. The *clean tech* boom has enjoyed public support - especially in Europe. Even so, billions of dollars „burned“ in start-ups, spending venture capital of angel investors: only a few companies have been able to apply the results of their developments on the market. The final global financial balance of this era is not *prima facie* yet: however, the practical outcomes are unquestionable: bio-gas, solar and wind power plants wherever one looks, hybrid and pure electric cars are the standard offer of some, if not all of the major car brands.

Right now, hundreds of Silicon Valley start-up founders are reorganizing their business around the idea of „decarbonizing everything.“ Together with engineers, they are leaving giants like Tesla to take advantage of the „generation's greatest opportunity“ - *climate tech*. Aside from public sector interest, without government support and subsidies, billions of dollars of venture capital are flowing into the new industry. Silicon Valley is on the threshold of a new boom; perhaps. And the rest of the world, including Europe, is breathing down its throat. Can we invest in climate change mitigation? If so, it turns out that activists will not play a key role; governments, engineers, and scientists will be second. The role of investors will be crucial: will they have the perseverance, the patience, and the faith that have hitherto been a specialty of the pharmaceutical, bio - and gene technology industries? Either way, we are talking about the potential revolutionary benefits of processes, about applications of technologies that are expected in public space. Despite the money that revolves around them and what it is about, undoubtedly, they are processes initiated by civic communicative action - ideas that are born in cafes, on picnics on a beach, and at parties.



Physical public space is deeply rooted in each of the so-called pillars of sustainable development - in the social, socio-cultural (including the economy) and „environmental“ pillars. All three pillars are connected by architecture.



The vast majority of European governments are committed to achieving carbon neutrality in a shorter or even shorter period of time.



However, architects have not yet made „their topic“ the subject of such discussions. Neither public space nor its mission - *saving the planet* in the context of the development of the built environment - has yet become the content and the goal of civic communicative action. Though overseen in both practise and theory, the very connection between the vitality of public space and the sustainable development of the built environment shall be taken as proven<sup>5</sup>. So far, they are not considered know-how or technologies that will fundamentally support efficiency and productivity of creating a public space that will be able to cope better with its diverse functions and to provide varied benefits - saving the planet between them. Modifications to free places, which are intended to elevate them to public space, are quite frequent in civic discourse, but this does not seem to be enough. Those who expect architecture to improve the quality of human life in a specific way (or the quality of *life on Earth* in general, not to mention *saving the planet*) need to be involved in the discussions.

The effective unsatisfied demand is to be articulated and made visible, the latent demand is to be awakened, and those who would like to invest in the indicated development of architectural craft technologies with the vision of double- and multi-digit profit are to be attracted. Experience shows that - unlike software applications, renewables, carbon footprint reduction, and climate change - architecture does not have an effective lay audience, nor does it have investors. Then, of course, architects must either *save the planet by public space* against the will of the public, or at least without its interest and without the support of investors, or they must get their craft and its potential and production back into the public space of civic debate. The physical public space, parched after the lockdown, should be in optimal condition in this regard - ready to receive anyone who wants to revive it. And virtual public space is on the threshold of upgrading the technological development of virtual and augmented reality, which can effectively support the return of architecture to public space.

Up until now, the unthinkable is to be thought<sup>6</sup> to show investors the opportunities of developing architectural design technologies that will both increase the productivity of architects' work, support the quality of designs, and therefore increase the quality of the final product, which is architectural design in the context of public space. It is investment into - of a kind - production technology. Both effects offer the hitherto „unknown“, ill-considered and untapped production potential of the virtual and augmented reality environment; demand can be expected

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<sup>5</sup> ibid

<sup>6</sup> Jensen, N.: To Save the Ocean We Need Less Talk, More Action. [oceans.nautil.us/feature/641/to-save-the-ocean-we-need-less-talk-more-action](https://oceans.nautil.us/feature/641/to-save-the-ocean-we-need-less-talk-more-action). retrieved Nov 24, 2020.



It is necessary to include in the discussions on the modifications of public spaces, which are to be aimed at their promotion to public space, those who expect from architecture a concrete improvement of their quality of life.



New opportunities, consisting in the development of architectural design technologies, will both increase the productivity of architects' work, support the quality of designs and increase the quality of the final product - architectural design in the context of public space.



from both architects and users of public space. The motivation of users of new technologies can be economic - higher labor productivity, higher sales for a larger volume of production, higher remuneration, or a competitive advantage due to the higher quality of the final product of architecture and public space. The target group of users of public space is unprecedentedly large: all of us. It seems to be more complicated to monetize higher product quality: but as has already been said, it is necessary to think the unthinkable. A good bottom-line has been provided by *the lockdown*: now, unlike in the past or at least much more than in the past, we want physical public space, and we appreciate it.

If *climate tech*, why not *architecture tech* as well?! The potential contribution of architecture to the sustainability of life on Earth is no less than the potential contribution of sneakers made from coffee grounds or of the production of industrial gases from agricultural and food waste. Research on the processes of development and decline of enclaves in the built environment<sup>7</sup> shows their communicative essence. Communication is the basic principle of the city and the basic unit of the settlement structure - from a historical point of view and in terms of sustainable development of the built environment; public space is the platform of this communication. The built environment is the *world of human existence*,<sup>8</sup> architecture is the communicative interface of human existence and the universe. It is hard to imagine a sustainable human life on Earth without sustainable urban development: a vital, authentic urban public space is proving to be a constituent of both. Architecture is a constituent of urban public space, the care of public space is a crucial task of architectural craft.

Moreover, climate tech and architecture tech can offer synergies: new materials that are a product of climate tech and new technologies. If their functional and capacity properties will overcome the possibilities of the current material, product, and technological base of the construction industry then they will open up new possibilities; undoubtedly new possibilities for the development of the built environment, hence the materialization of architecture, possibly for architectural space and concepts. UHPC concretes, advanced 3D printing, nanotechnology, cybernetization, and robotic construction are perhaps the first harbingers of a revolution in building materials, structures, and technologies that will not only change the field of construction but also contribute to an architecture revolution.

<sup>7</sup> Sourek, M.: From Functional Areas towards Structure of Public Space: Sustainable Development of City in Context of Social-Cultural Values' Communication. *Advanced Engineering Forum*. Trans Tech Publications 2014. vol. 12, pp 176-180, doi: 10.4028/www.scientific.net/AEF.12.176.

<sup>8</sup> Heidegger, M.: *Sein und Zeit*. Tübingen: Max Niemeyer Verlag 2006, ISBN 3-484-70153-6.



Communication is the basic principle of the city and public space is the platform of this communication.



Technological and investment synergies are not limited by the boundaries of the built environment: they also apply to the Earth's natural ecosystem, which calls for an end to decline no less than public space calls for recovery: climate change is just one of many components of decline that seems to affect human existence. The theme of saving the planet, the renaissance of public space, and the „next level“ of the development of the built environment are in fact subtopics of the idea of sustainable earthly life. Their synergy also lies in the need to go beyond ideas and start thinking and implementing change as part of a common project: it is time to admit and actively grasp the fact that we can invest in a sustainable future. Continuous investment in technology development represents the most realistic, if not the only feasible option for implementing the sustainable future project: this technological and investment base includes architectural design as well as the production of new materials for industrial use from waste or the restoration of natural ecosystems.

For the time being, all this will perhaps have its origin in public space: in the „new“ virtual, no less than in the traditional public space of communicative action. Public space can become a horizon and an incubator of multiple benefits for *the world of our being*<sup>9</sup>.

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<sup>9</sup> ibid



Continuous investment in technology development is the most realistic feasible option for implementing a sustainable future project.

# Summum templum architecturae

*„Architecture is a constituent of urban public space; is the communicative interface between man and the universe.“*

*It is time for public space to fulfill its potential and become the horizon and incubator of the contribution of architecture to sustainable living on Earth and its quality. The causal link between the vitality of public space and the sustainability of development of the built environment, and thus the sustainability of life on Earth, is proven<sup>10</sup>.*

A renaissance is not only needed (urgently) by the physical public space: it is also needed by the discipline of architecture in general. From Vitruvius<sup>11</sup> through Alberti<sup>12</sup> to the end of the great styles at the beginning of the long 19th century, neither architectural work nor architecture as a field stood in the competition alongside other arts and skills and creations of technology: artistic disciplines and sciences, technology and crafts were applied only within the summum templum architecturae - the highest temple architecture as a part of it. As long as architecture was a summum templum, the physical public space was her showcase: as soon as she lost sight of it, she began to find herself in seclusion. If people, society, and political representations ask today *What now? How will humanity work „after coronavirus“ and with its experience?*, it is an opportunity for physical public space and architecture to work together, hand in hand.

The deficit of physical contact with other people, with society, and with the environment that we experience in quarantine conditions caused by covid\_19 showed a demand - a great demand for physical public space. At the same time, the development of virtual public space - specifically information and communication technologies, generating virtual and augmented reality - shows the opportunity for their further development, which will mean a revolution in architectural design technology. Demand and the opportunity to better meet it have a natural potential to motivate investment: but not (only) the usual investment in the development of the built environment, „real estate investment“, but also and above all a new, unprecedented investment in the development of design technologies, in the virtual reality environment, in the development of virtual public space: investing in the development of virtual public space for the benefit of the development and of the quality of physical public space.

<sup>10</sup> Sourek, M.: M.: From Functional Areas towards Structure of Public Space: Sustainable Development of City in Context of Social-Cultural Values' Communication. *Advanced Engineering Forum*. Trans Tech Publications 2014. vol. 12, pp 176-180, doi: 10.4028/www.scientific.net/AEF.12.176.

<sup>11</sup> Vitruvius, M. P.: *The Ten Books on Architecture*. original title De architectura [libri decem], translation Morris Hicky Morgan. Kessinger Publishing 2005. ISBN 9781417969579.

<sup>12</sup> Alberti, L. B.: *On the Art of Building in Ten Books*. MIT Press 1988. ISBN 9780262010993.



If the pandemic recalled the value of physical public space for human existence, or it contributed to the return of our memory in this regard - it also proves useful to recall the importance of basic terms. Concerning public space, we have already tried to do so, at least by listing examples; it is crucial to distinguish public space from free places and to keep in mind the fundamentally communicative nature of public space. Public space is a platform for communication between people, within society, and between people, communities, and society on the one hand and their surroundings on the other. The environment includes material and cultural, social, and spiritual components. The concept of urban communication includes both natures - it includes Habermas communicative behavior<sup>13</sup> and McLuhan's media as an extension of man<sup>14</sup>, as well as supply infrastructure - the supply of energy and drinking water, raw materials and consumer products, as well as waste and wastewater disposal.

There could be no question of Habermas's civic communicative behavior in ancient pre-antique cultures and societies. However, they also inhabited public space: a broader definition is offered. Public space is a space of communication with the world of human existence: architecture as a constituent of urban public space is a communicative interface, a daily mediating medium between man and the universe that includes the human society, too.

The relationship between public space and architecture is fundamental, mutually constitutive. But that would not be enough as to answer the question *What is architecture?*

It is time to forget the concept of architecture as an art of civil engineering. Architecture is the art of civil engineering in a similar way a master chef is an artist of agriculture: he also uses the meat and vegetables that have grown on farms. But there is no doubt that a grower of top raw materials is one craft and their processing in another one. Sure, every comparison is lame - but the relationship between architecture and civil engineering is quite similar to agronomy and gastronomy. Just like the garden and the cattle grazing in the meadow supply raw materials from which the chef creates the taste, smell, and appearance relating to the experience of consuming dishes, civil engineering combines „raw materials“- constructions, surface treatments, products (windows, doors, railings,...) - with which the architect works when developing and preparing for the materialization of architectural ideas. The team characteristics of one and the other

<sup>13</sup> Habermas, J.: *Theorie des kommunikativen Handelns*. Frankfurt am Main: Campus 1981, ISBN 3-518-28775-3.

<sup>14</sup> McLuhan, M., Lapham, L. H.: *Understanding Media: The Extensions of Man*. The MIT Press 1994. ISBN 978-0262631594.



The epidemiological crisis of our present opens up opportunities for the development of physical public space and the rise of architecture.



„artistic craft“ are similar. The master chef specifies together with the grower at what stage of ripeness the harvest should be harvested and how the vegetables supplied by the grower are to be stored after the harvest, and the mood of the room and service contribute to the experience of dinner, too. Similarly, the architect co-operates closely, consults his ideas both with civil engineers and producers of materials and components. The experience of architecture is influenced by details of its operation: when and to what extent it is artificially illuminated, how its natural ageing is controlled and how it is maintained. Architecture and gastronomy typically meet in restaurants: the visual experience of restaurant architecture contributes to the culinary experience and vice versa.

Architecture is a lasting physical spatial structure created by man in a particular place, resonating with the values of the environment, which has the nature of public space: being exposed to public space, the building structure, the building work becomes an architecture. The values of the environment with which architecture resonates - reacts to them and they react to it - communicate with each other. They have a socio-cultural nature (especially), but also a material one: an aesthetically mediated experience of national or municipal pride in case of a town hall or parliament building, cultural experience in case of a theater. Architecture also requires resistance to penetration of heat, water or foreign objects, to which we reply upon so that we are not cold rained on or the performance is not disturbed by a bunch of teenagers playing with a ball. Public space brings to architecture the today-much-emphasized topic of climate change and „*saving the planet*“. It is not about the numerical balance of energy consumption or CO<sub>2</sub> production - it is about public space as Heidegger's *world of our authentic being*.<sup>15</sup> It is about our responsibility, guilt, or debt - according to how you translate Heidegger's Schuld<sup>16</sup> - to the environment we are going leave to our descendants as the inheritance.

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<sup>15</sup> Heidegger, M.: *Sein und Zeit*. Tübingen: Max Niemeyer Verlag 2006, ISBN 3-484-70153-6.

<sup>16</sup> *ibid*



The deficit of physical contact with other people, with society and with the environment, which we experience in quarantine conditions, showed the demand for physical public space.



Architecture is a constituent of urban public space; is the communicative interface between man and the universe.



# Architect as a screenwriter

*„Architecture is born  
in the imagination of the  
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and so far not in computers.“*

When looking for an answer to the question *What is architecture?* the mutually constitutive relationship between public space and architecture was confirmed and elaborated as essential. However, the public nature of the architectural space is not the „only“ essential: the spatiality of the architecture itself is no less fundamental. Space is the building block of architecture: the space we live in - three-dimensional, rather four-dimensional space, when the fourth dimension is time, more precisely *being*<sup>17</sup> (of man in architecture; being comes into play with natural and artificial light, fresh air and drafts, smells and odors, damping and sound reflection, reverberation and echo...)

How does this spatial phenomenon arise? It is created by building, which is a form of poetry: *Full of merit, and yet poetically lives Man*<sup>18</sup>, Heidegger quotes Hölderlin. Let the builders not be angry: their „merits“ are not enough on their own, the world of human existence is the fruit of a poem, and not of any poem - only of an authentic, shared one. Architecture - the poem is shared in public space: yes, only when exposed in public space, the construction piece becomes architecture.

Architecture is born in the imagination of the authors - not in sketches, nor on drawing boards, and so far not in computers. The question of how architecture is being designed, even among professionals, is not as trivial as it might seem: in fact, the answers that are likely to be wrong or misleading would probably prevail. Poetry has already been talked about: poetry, which is building. Building does not begin with the excavation of foundations and does not consist of laying brick on brick: building begins with a vision of space: it is an experience in space - an experience of space. The experience of space, which is based on its attributes: above all its proportions and size, measured not by meters, but by the being of man and its other inhabitants - those and those who are in the space - and its relations with the surrounding spaces.

The experience of space is based on the nature and structure of the perimeter by which space is defined: these, together with events in space and natural events of the time - day and night situations, situations of seasons - form light and shadow, reflection, temperature, airflow, smells and odors, acoustic phenomena already mentioned. All these (and many other) aspects of architectural space are important as they shape the experience of space. These are great, exceptional, and festive emotions, as well as every day and very practical emotions: the archi-

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<sup>17</sup>ibid

<sup>18</sup>Heidegger, M.: *Voll Verdienst, doch dichterisch wohnet / Der Mensch auf dieser Erde. [Heidegger und Hölderlin, herausgegeben von Peter Trawny]*. Vittorio Klostermann 2000. ISBN 978-3-465-03084-3.

texture of a Gothic cathedral, the architecture of a humble cottage, or living in a „block of flats“ (the link is, let's recall, an exhibition in public space).

Through emotions, aspects as practical as the comfort of the microclimate, the leaking roof, or the carbon footprint of the building enter into architecture. It is not about their numerical values, but how they enter the user experience: an ordinary family house that cannot be heated in winter at 20 degrees Celsius is not perceived as good architecture: the aesthetic visual experience goes away - it does not „make“ architecture (in these cases). However, the fact that Villa Müller<sup>19</sup> leaked until its refurbishment from 1997 to 2000, did not detract from the architectural quality of the building; in the same way no one cares about the physical microclimate of a Gothic cathedral.

For most of the history of architecture, particular architectures have been dominated by one or a few spaces: the temple space or the temple naves' space, the grand hall and lord's chambers' spaces, the stoy space, the market hall space, the library reading room, the auditorium and theater stage space,... Few and well- arranged are and were exterior spaces of particular architecture: streets, public spaces, squares, gardens,... Functional specializations of particular spaces, mass use of buildings, and finally collectivism promoted the principle of addition in architecture, which obscured the basic spatial view - to cover it completely for many: to grasp the spatial essence of an apartment building is more difficult than to understand the fundamental spatial aspect of an ancient temple.

However, the spatial nature of architecture has not disappeared - it persists, and it is necessary to restore its understanding, to grasp it again. It is worth repeating: it is an experience in space - an experience of space. If - for reasons of the building program - there are to be multiple spaces, the architect must work as a screenwriter: the first realisation of architecture in a communicable way must be „a pictorial scenario“ capturing the decisive „shots“ - their visual aspects and atmosphere. Time is also a dimension of architecture and the movement of a person (and other actors) in relation to it. More „shots“ belong to individual „scenes“ - an infinite number of „shots“, but only some of them are significant. „Scenes“ are located inside and outside the conceived building: unlike most practices, those inside tend to be more significant.

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<sup>19</sup> Loos, A.: *Villa Müller*. Prague, Nad Hradnim vodojemem 14/642, 16200 Prague 6 – Stresovice, 1930.



Attalova stoa / Athens 159 BC.



Andrea Palladio: Teatro Olimpico, Vicenza, 1580-1585. The oldest theater „under the roof“ in the western hemisphere.



# LEGO kits and virtual reality

*„The material of architecture is the three-dimensional space in which we live, not the structures, not the walls and their artistic treatise.“*

*The architect's imagination focused on spaces, their aspects, and mutual relations, is not unrestrained and free: it stems from- and at the same time, bound by knowledge and experience. The role of techniques and technologies is significant; so far, it eludes attention. It is neither only nor primarily about construction techniques and technologies: the influence of techniques and technologies by which the idea of architecture is fixed, concretized, and communicated is crucial. They are mostly techniques as old as the craft of architecture itself, and they are not very sophisticated techniques.*

Since ancient times, architecture - until it is embodied in the building - is shown by two-dimensional drawings of floor plans (imaginary horizontal sections of the intended architecture), vertical sections, and views of the walls of the architecture - from the outside, less often from the inside. And according to such drawings, architecture is also built - materialized in the building, constructed. However, the material of architecture is the space in which we live - three-dimensional space, not structures, not walls and their artistic treatise: all parts of a building participate in architecture only insofar as they participate in shaping spaces inside and outside the building. The 14th century brought the constructive perspective - the future architecture was depicted spatially, but always secondarily - according to floor plans and sections<sup>20</sup>. The author's sketches can also be perspective representation: but these, rather than future (perhaps) architecture, express the author's idea. The conflict between the three-, four-dimensional product and the two-dimensional technology by which the product is „manufactured“ is evident.

Computer technologies have significantly improved and simplified the constructive perspective representation of proposed architecture. However, the technology of spatial representation has not changed: it is necessary to plot the parameters of the proposed building - only then the computer creates its spatial model, which is available for any display, provided with reality imitating textures, colors, lighting situations. This is called virtual reality.

Most recently - at the end of the second decade of the 21st century - computer programs appear to allow free sketching „in space“. Spatial perception technologies are also available - so-called 3D glasses. However, even they cannot replicate space realistically, let alone be created with their help: from the essence of percep-

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<sup>20</sup> Andersen, K.: The Geometry of an Art. The History of the Mathematical Theory of Perspective from Albeti to Monge. Springer 2007. ISBN 978-0-387-48946-9.  
Cole, A.: Perspective (Eyewitness Art). Dorling Kindersley Publishing, Inc. 2000. ISBN 0789455854. Hockney, D.: Secret Knowledge. Rediscovering the Lost Techniques of the Old Masters. Thames & Hudson 2001. ISBN 9780500286388.

tion from a single place, a perspective distortion always applies, the consequences of which cannot be completely overcome even by the movement of the observer / creator in space. And, of course, there can be no question of mediating other aspects of architectural space - let's recall acoustics, time and events in space, airflow and the quality of the microclimate, smell, ... In addition, an even bigger stumbling block - a problem that has not yet been satisfactorily solved - is the fixation and concretization of the proposal thus created.

When designing architecture, architects are reliant on traditional - age-old techniques and technologies. All the techniques and technologies have one thing in common: with their help, employing them, architects do not design architecture itself, but only its image; a two-dimensional image of a three- (four) dimensional essence. The difference between architecture and its image does not lie „only“ in the difference between the visual perception of real architecture and its visualization, or orthogonal representation. The perception of real architecture is far from just visual, other senses are involved - these have already been discussed. And let us recall memory and experience: this is the fourth dimension of architectural space, too. The difference between architecture and its image is significant, it falls into many areas of theory and (especially) practice. It influences not only architectural creation but also the built environment and its development in general.

The „side effects“ of traditional techniques and technologies are undesirable in general; they have two natures. On the one hand, they obscure the real goal of the creative process, distract from it, and put false goals in its place. And they excessively increase the complexity, the complexity of the process, at the beginning of which there is an architectural vision and at the end a materialized part of the built environment. Both are inevitable consequences of solving a spatial, more precisely multidimensional problem on paper - or „on paper“ = in two-dimensional abbreviation, interpretation.

Objection: we have virtual and augmented reality, we no longer rely on two-dimensional representations - developers of AR and VR computer programs - augmented and virtual realities in their jargon - claim and argue - and together with them those who are in charge of marketing and sales support for real estate projects.

However, the objection does not stand up once we take into account how effective photorealistic visualizations and animations for „3D glasses“ are created and what their application is in the practice of architectural design. What has al-



The material of architecture is the three-dimensional space in which we live, not the structures, not the walls and their artistic treatise.



The perception of real architecture is far from just visual, other senses, memory and experience participate in it.



ready been said remains state of the art: first, it is necessary to „bring out“ the parameters of the proposed building - and only then, the computer creates its spatial model, which is available for display. These images are used in the design process as a source of feedback, control over what has been created by a technology that is, to a decisive extent, still traditional. Nothing close to designing the architecture directly in the VR / AR environment happens: the necessary tools are not available.

The difference between drawing the traditional images of architecture and the immediate creation of architecture illustrates well an example. Give a small child general Lego building blocks: he will easily build a „house“ according to his ideas. Ask him to draw the plans of the house first: he will draw only something on the verge of intelligibility, and he cannot build anything according to them. Dads know this: more complex objects made of specialized building blocks, according to the multi-page instructions, are constructed by dads for their children up to the age of six or seven.

What this means: an architect is not a small child, they have undergone a long and relatively demanding vocational training; thanks to this, they can draw plans, and even in a way that enables the builder, who also has appropriate professional training, to construct a house from the plans. But there is no doubt that a large amount of energy, time, and cost falls on the creation of plans that in themselves - compared to real architecture - have little if any, value. It is also clear that the design process is taking longer, when the architect designs intuitively, „blindly“ something they have no opportunity to check: they will be given feedback only when the building is constructed, this works but the „drawing“ used is only a partial representation of the reality.. This process of illustrating a design only happens after the architect „feeds the computer“ with parameters. The difference between the illustrated and the real is fundamentally different.

*Virtual and augmented reality could overcome this difference (at least in part, gradually, step by step) - they could move the design of architecture to a new (finally - after millennia of traditional techniques) level, the comfort of which promises not only higher productivity of the craft but also higher quality architecture. Can they do it? Will architects finally create architecture „immediately“? It is about creating virtual twins of architecture, not about creating the architecture itself, materialized in reality - but this (over time - with the development of AR / VR technologies) could make little difference, but considerable advances in engineering and design technology.*



Give the little child general Lego building blocks and he will build a „house“ without any problems. But if you ask him to draw plans for the house first, he can't build anything according to them.



Yes, computer-generated virtual „reality“ can provide feedback, but only after the architect has „fed the computer“ parameters.

# Architecture created immediately

*„Virtual reality is not a goal,  
it is not a product - it is a means  
to achieve the goal, which  
is architecture.“*

Due to its spatial nature and a „static“, lasting substance, architecture should be „at home“ in virtual and augmented reality. Let us recall that both virtual and augmented reality are part of virtual public space - the virtual space in which many experiences, benefits of urban communication that have their roots in physical public space, have already become domesticated. Examples are broadcasts of concerts and theater performances, as well as conferences, seminars, and schooling through information and communication technologies. The quarantine measures related to the covid\_19 pandemic have accelerated, deepened and in many cases made the virtualization of the benefits of physical public space a „monopoly“. This certainly did not bring it into the world: all these and many other cases of virtual parallels, „twins“ of physical public<sup>8</sup>space are substantially older than SARS-CoV-2. So far, architecture virtualization has been used primarily in instrumental communication, as defined by Habermas: in advertising, in sales promotion, as a technique for presenting an architectural design to project partners (including the public). The similarity of virtualized architecture with the internet transmission of a concert is only superficial, rather misleading: music reproduced by audio technology is a performance of the performing arts as well as live music in a concert hall; rather than the quality of the acoustic experience, the distinction is made by the social, socio-cultural complements of a concert hall visit. It is a pity if the transfer of the architecture to VR / AR, to the virtual public space is exhausted by the transfer of its image (even if a dynamic, interactive one).

The challenge and opportunity of the virtualization of architecture lies in the transfer of the design process to the VR / AR environment. It is about a real transfer of the architect's creative work to the VR / AR environment. The innovation must not end with a generic representation of architecture, defined by parameters of material substance - structures, constructions that are to materialize the architecture. As a principle, the procedure must be the opposite: directly in the VR / AR environment, it is necessary to create, build a virtual twin of the future material architecture. Just as a child can easily build a house from the kit blocks that he has been given, the architect must build a virtual twin of (future) material architecture from infinitely flexible spatial elements. Hence technology; grasping other aspects of architectural space - let's recall acoustics, time and events in space, airflow and the quality of the microclimate, smell,... - is perhaps a question of further development of technology. Mastering the essence of architecture commands that the architect does not construct structural elements: if they are to design immediately - create! With authentic architecture, they must focus on the spaces inside and outside the proposed building: the spaces are the „cubes“ of the „kit“.



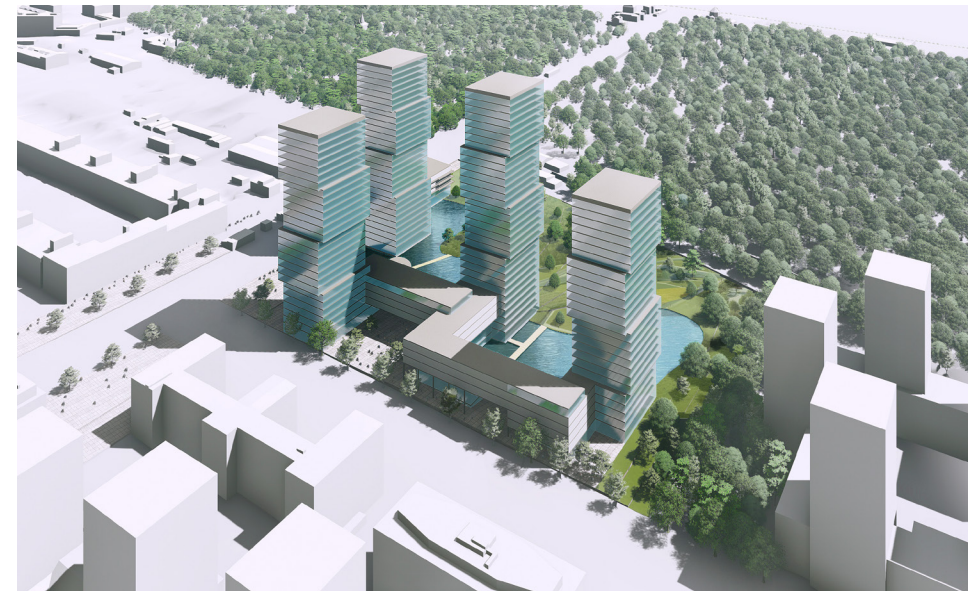
The transfer of architectural creation to public space, whether it is an unintended, perhaps even unwanted context of its transfer to VR / AR, brings other opportunities, hitherto barely surmised: even if (so far) they were only „by-products“ of immediate architectural creation in VR / AR. Gasoline was originally also just a waste of industrial production of kerosene: even the mere possibility of following the design process by the public in an augmented reality environment is a benefit. It is no coincidence that „participation“ (public involvement in the design process) is now a living topic of architectural practice and the practice of developing the built environment.

The circle closes: During the first anthropological rebirth<sup>21</sup>, in the processes of literaization and urbanization, rather as their product, a virtual public space emerged splitting from the physical, urban public space. Initially relevant only to a narrow class of society's elites, its scope and impact begin to grow, beginning with the expansion of the print media, and at the latest with the development of electronic communication technologies (electric telegraph 1836 and 1839); social and socio-cultural communication largely leaves the physical platform. From the penultimate decade of the 20th century, it seems that virtual public space, especially information and communication technologies will make physical public space a minor and marginal phenomenon - perhaps in the sense of McLuhan's *old form, which automatically becomes art*<sup>22</sup>. It wasn't until the covid-19 lockdown that the magic wand showed that we were generally wrong. We need physical, urban public space in its various forms to live; when we are denied it, we suffer. We also realized that over time, physical and virtual public space partially transfer and exchange sub-roles - and they do not have to compete, on the contrary: one replaces the indisposition or deficit of the other and overcomes obstacles to its use; but only to a certain extent. A typical example of such cooperation is „virtual access to the public“ - „publication“ - of private land and buildings, as well as concert halls or sports stadiums through the media or books.

*The unsuspected possibilities, capabilities of information and communication technologies today allow the virtual public space to repay its debt to the physical public space, from which it split six thousand years ago. Virtual public space is ready to accept physical public space and its constituent - architecture - into the environment of virtual and augmented reality. Virtual reality is not a goal, it is not a product - it is a means to achieve the goal, which is ar-*

<sup>21</sup> Krejčí, J.: *Postižitelné proudy dějin*. Praha: SLON 2002. ISBN 8086429091.

<sup>22</sup> McLuhan, M., Lapham, L. H.: *Understanding Media: The Extensions of Man*. The MIT Press 1994. ISBN 978-0262631594.



Will architects finally be able to create architecture in a more efficient way? Virtual and augmented reality could take architectural design to a new level, with the advantage of a more productive design process and a higher quality of architecture.



Virtual and augmented reality are part of virtual public space - the space into which SARS-CoV-2 has displaced experiences previously rooted in physical public space, such as concerts, conferences and theatre performances ...

*chitecture. In the VR / AR environment, the virtual public space will offer unique conditions for the development and practical application of the architectural imagination: for the first time, the creators will create architecture directly (create a virtual twin of future architecture) - instead of creating its images. The ontogenesis of architectural work from the original idea will be fundamentally easier and faster; and will lead to higher quality.*



It is unfortunate if the transfer of architecture to VR / AR, i.e. to the virtual public space, is exhausted by the transfer of its image (for example, dynamic, interactive).



Only the lockdown showed us how important physical public space is to us. We need physical, urban public space in its various forms to live - when we are denied it, we suffer.



# On the brink of a revolution

*„Architecture as the world  
of human existence  
are on the brink of a revolution:  
the largest one and first  
of its kind since the beginnings.“*

Designing architecture, and together with it the development of the built environment, architecture as the world of human existence are on the brink of a revolution: the largest one and first of its kind since the beginnings of the field. It will be a shift greater than taking over the responsibility and competence for construction as the materialization of architecture, when Leon Battista Alberti entrusted them to the architect, declaring the builder *a mere tool in the hands of the architect*<sup>23</sup>; a greater change in the profession of an architect than caused by the entry of engineers - not only the École Polytechnique graduates - into the practice of designing buildings, together with a general expansion of the belief in their unlimited ability. It will be a greater change of course than the one launched by the concept of Marc-Antoine Laugier's *primitive hut*<sup>24</sup> - and will correct its unfortunate effects in public space; a transformation more pronounced than the *international style*<sup>25</sup> of Henry-Russell Hitchcock and Philip Johnson. Along with this revolution, unprecedented materials and technologies will be used in construction, the novelty of which will overshadow the influx of new materials, structures, and technologies into construction practice during the long 19th century. From the point of view of utility, the revolutionary architecture will overcome the dominance of *functionality* (over time, especially material functionality) of buildings as well as the collectivism, which have begun to be applied since the mid-19th century, or since the 1930s. The realization of this revolution will be extremely challenging because it is a matter of complex synergy of paradigm shift of the architect's work and development of a corresponding set of tools - computer programs working in VR / AR environment and, at the same time, able to control and complete with information in real-time the parameters of a virtual twin of the future building - the structure that materializes architecture. The synergy of architects and software developers, which has not yet been demonstrated by both disciplines: the thousands of existing computer-aided design support programs - „CAD“ - do not contradict this statement: the opposite - their functional concepts and principles confirm the statement.

So far, parameterization was the goal of computer aid for building design (it is not possible to talk about architecture in this context): technology based on the idea that the optimal solution is a product of objective work with data, correct calculation. The paradigm is, it is necessary to obtain as much quantitative data about the initial situation and define quantitative target state parameters - the path from one to the other is a matter of calculation; and computers are the best at calculating.

<sup>23</sup> Alberti, L. B.: *On the Art of Building in Ten Books*. MIT Press 1988. ISBN 9780262010993.

<sup>24</sup> Laugier, M.-A.: *Essay Sur l'Architecture*, 1753. <https://archive.org/details/essaisurlarchitecture00laug/>. retrieved Nov 21, 2015.

<sup>25</sup> Hitchcock, H.-R., Johnson, P. C.: *The International Style*. W. W. Norton Company Inc. 1995. ISBN 0-393036510.

Parameterization seeks to distort architecture from the beginnings of architectural modernity with an attractive offer of pre-prepared standardized solutions: the result should be higher production productivity. We Czechs have an extremely rich experience in panel construction in this respect. Many people think that this is the past because the production of reinforced concrete precast units has more or less ended, but we have a new parameterization. This is exactly the principle that design software works on - Archicad, Revit, ... And even urban parameterization has emerged: Sidewalk Labs, Google's sister company, has come up with the idea that it has software that will design the optimal or ideal city. People make mistakes, machines don't, so all you have to do is collect enough data and pour it into your computer: this is how the Quayside district was supposed to be created in Toronto. The 30-member Sidewalk Labs team collected data and programmed for two and a half years - to then end the project prematurely due to the escalation of disputes between Sidewalk Labs, the city administration, and the city's residents. People refused to exchange socio-cultural values - their privacy and interventions, their experiences „great“ and everyday, and a bit of freedom - for material convenience based on algorithms<sup>26</sup>.

It is time for architects to begin to realize what they are sacrificing in exchange for the convenience and productivity of parametrizing work tools: parameterization is (perhaps) a good servant, but a bad master. Parameterization is a good tool for optimization, but it will never create a superb concept. Technological progress in architectural design, in the conceptual, truly creative design of architectural space, can be based only on virtual or augmented reality. This is the environment in which there can be virtual twins of future architecture - buildings not yet built or designed - from the first sketch to the BIM project documentation. In this environment, the virtual twins will be approached, each in their way, by the partners of the development projects of the built environment (the public included).

Mastering the VR / AR environment is an even greater challenge for architectural creation than the one, which Gottfried Semper, himself a Neo-Renaissance practitioner, addressed in 1948 to the incoming architects under the title *Über Baustil*: *Today, architects are blamed for lack of ingenuity because a new worldly idea is not being applied, accompanied by strength and self-confidence. We are convinced that this or that of our younger colleagues will be lucky to find a new form. Until that happens, we have to dress in old as long as we can.*<sup>27</sup>

<sup>26</sup> Hawkins, A. J.: Alphabet's Sidewalk Labs shuts down Toronto Smart city project. The Verge. <https://www.theverge.com/2020/5/7/21250594/alphabet-sidewalk-labs-toronto-quayside-shutting-down>. retrieved Jun 7, 2020.

<sup>27</sup> Semper, G.: *Über Baustil*. Deutsche Bauzeitung 2015. <https://archive.org/stream/deutschebauzeitung2518frit/>



Finally, the VR / AR environment will allow you to create architecture directly (to create a virtual twin of future architecture) - instead of creating images of architecture, like we do today.



Different methods of designing architecture were found before the virtual revolution began. The new industry will be a shift greater than taking on responsibility for construction as the materialization of architecture, which Leon Batista Alberti entrusted to the architect when he declared the builder is „a mere tool in the hands of the architect.“



Space, technologies, architecture and investors  
author: Michal Šourek  
published: MS architekti s.r.o., 2021  
editorial and graphic design: František Průša

