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Editor-in-Chief
Agnieszka Sikora, PhD

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Text Authors
Adam Bała, Weronika Cygan-Adamczyk, Małgorzata Kłoskowicz, PhD, Olimpia Orządała, Paweł Porębny, Agnieszka Sikora, PhD, Katarzyna Suchańska, Maria Sztuka

Proofreading of the Polish version
Katarzyna Litwinowicz

Translation of the English version
Artur Adamczyk

Cover
Jagoda Raźniewska, work from the series *The Price of Excess*

Graphic Design, preparation for print
Patrycja Warzeszka

Szombierki Heat Power Plant | Photo: Arkadiusz Janocha / Bytom City Hall

Cities that owe their growth and success to such natural deposits as coal are now well past their prime. The progressive decarbonisation of the energy industry, the massive increase in the cost of exploiting this raw material, and the growing risks of reaching ever-lower seams are making coal mining unprofitable. Environmental challenges pose a powerful argument to limit or even abandon its extraction altogether. The European Union aims to achieve climate neutrality by 2050. The fate of coal seems to be sealed. Economic, social and, above all, climate considerations are taking precedence. The doomsday scenario of cities that have been mainly sustained by the all-too-familiar mines has become a reality for many European conurbations.

TO ESCAPE THE APOCALYPSE

In 1989, Poland had 70 active hard coal mines; as of December 2024, only 19 are still in operation. These might be just raw numbers, but in the second half of the 1990s, there were six hard coal mines operating in Sosnowiec, a city with a population of nearly 260,000. In 2015, the last trolley left its last active mine, KWK Kazimierz-Juliusz. Today, mining in Sosnowiec is a thing of the past, and the population equals less than 190,000 residents. This is the case all throughout Silesia and the Zagłębie region.

For many years now, researchers have been looking closely at those cities which, as a result of unfavourable economic changes, have not only lost their high regional status but are in decline due to losing their primary sources of income as well. Painstakingly built up over several decades, they were moving towards the utopian city of prosperity based on natural wealth. The move away from their main source of income is forcing the residents to adapt to the changes and find an alternative as quickly as possible. Otherwise, they will face a dystopian vision of a grim, impoverished city heading for collapse.

In 2023, an article by Elżbieta Zuzańska-Żyśko, PhD, DLitt, Associate Professor and Valentin Mihaylov, PhD, DLitt, entitled 'Is a post-dystopian urban future possible? Alternative scenarios for Bytom' was published in the *Bulletin of Geography. Socio-economic Series*. Researchers from the Institute of Social and Economic Geography and Spatial Management at the Faculty of Natural Sciences of the University of Silesia conducted an in-depth study of areas with clearly present dystopian conditions. They analysed such topics as depopulation, social polarisation, ghettoisation, urban decay, and mining damage. 'Utopian and dystopian concepts are, by definition, focused on a vision of the future. Utopia involves the creation of an ideal society, which lives in prosperity and harmony, while a dystopia is to some extent equivalent to an approaching apocalypse. Our primary challenge was to seek an answer to the question: can urban dystopia be an observable state of the present that can be measured by specific indicators? That is, seen not as a vision of future – a side effect of utopian concepts – but rather as an observable and measurable state, explains Valentin Mihaylov.

Maria Sztuka

Elżbieta Zuzańska-Żyśko, PhD, DLitt, Associate Professor
elzbieta.zuzanska-zysko@us.edu.pl

Valentin Mihaylov, PhD, DLitt, Associate Professor
valentin.mihaylov@us.edu.pl

Institute of Social and Economic Geography
and Spatial Management
Faculty of Natural Sciences
University of Silesia

WHY BYTOM?

Because it brings together all the characteristic features of a post-industrial city and the problems faced by its residents and administrators. The city exemplifies the combination of stunning architecture of the urban fabric and an urban layout. The great scale of Bytom's demographic decline can be compared to that of such post-industrial cities as Detroit or Pittsburgh, although – as the researchers acknowledge – both of these cities are well past their dystopian period. In the 1970s, Bytom had eight coal mines, two zinc mines, and two steelworks. The Bobrek mine is the only one that has survived to the present day, but even its fate is sealed. It was supposed to remain active until 2040, but following a negative opinion by the Natural Hazards Commission, it will be closed down in December 2025.

Bytom, which developed remarkably well at the beginning of the 20th century and during the communist era, was the beating heart of the region. It not only boasted rich industry but also attracted outside people with its vast cultural offer. There was an opera house, excellent schools (ballet, music), a thriving museum, great educational institutions, high-level of services, elegant establishments...', recalls Elżbieta Zuzańska-Żyśko.

The first wrong decision, which turned out to have tragic consequences, was Bytom's rejection of the Upper Silesian Railway. Katowice, on the other hand, did not refuse the offer and consequently became one of the largest and most important railway junctions in Poland. The railway finally came to Bytom more than twenty years later, in 1869.

Bytom's social sphere underwent total deconstruction after World War II. The victorious Red Army destroyed the town and then began the forced evictions and a 'de-Germanisation' campaign. Bytom lost half of its population, which was replaced by people from the former Polish territories, mainly from the Lviv, Stanisławów, and Ternopil voivodeships. In 1951, the neighbouring municipalities were incorporated into the city: Bobrek-Karb, Miechowice, Szombierki, and Łagiewniki, which not only destroyed the local identity of these municipalities but also turned the harmoniously developing city into a unmanageable and lacking-in-character giant. The city lost its importance and influence in the region and became a typical mining and labour centre.

'While other cities were developing a broad service system, attracting new investors, developing a new technology sector, and experiencing similar innovations, time stood still in Bytom with regard to the extraction and processing of natural resources. Monopolised by mining, the labour market quickly became stagnant, earning Bytom the status of a shrinking city', concludes Elżbieta Zuzańska-Żyśko.

Example of a revitalised public space in the form of a pocket park in Bytom's inner city | Photo: Elżbieta Zuzańska-Żyśko

DEPOPULATION

Although, according to scientists, a decrease in population does not always lead to unfavourable economic changes, it is worth noting that Bytom recorded its largest population in 1987 – the Central Statistical Office (GUS) data shows that the city had 240,000 residents at that time, while in December 2024, this number dropped to 129,000 (data from the Department of Civil Affairs of the Municipal Office in Bytom), which means that in a period of 37 years the city lost 111,000 residents. Such a loss is equivalent to the complete disappearance of a city the size of Chorzów (102,000 residents) or Dąbrowa Górnicza (105,000 residents).

Coal mining in the communist era damaged the protective pillars under Bytom, which led to the destruction of most of the tenement houses in the city. The mining damage had disastrous consequences. The city's negative image contributes to its poor reputation. Bytom is the clear frontrunner in the 'Ugliest City in Poland' ranking, despite having once prided itself on being known as Little Vienna.

According to Valentin Mihaylov, it is an unfair assessment, especially when considering the city's stunning architecture.

'We have put forward the theory', the scientist continues, 'that even if it was possible to overcome the economic problems, revive the post-industrial landscape, and restore the labour market to its former glory, this stereotype perpetuated by the residents of other cities will continue to live on for quite some time. After all, a similar concept of 'Black Silesia' still continues to live on in the shared consciousness of the people of Poland'.

Adverse changes have also affected the social sphere. Depopulation leads to various dysfunctions and an increase in the number of marginalised people. Rapid impoverishment also leads to ghettoisation. Examples include isolated groups of unemployed people moved to social housing and the Romani population resettled from Karb to Bobrek (their houses collapsed due to mining damage). According to Elżbieta Zuzańska-Żyśko, this was not so much a relocation of Romani people as their isolation in the Bobrek district, which ended up creating another disadvantaged urban area.

PROSPECTS NO LONGER SO BLEAK

There are several possible rescue scenarios for Bytom. Researchers are leaning towards the idea of a semi-dystopia, a much milder vision than the previous apocalyptic one. They base their opinions on the positive signs that begin to appear, short- and long-term repair programmes, the explosion of grassroots social initiatives, the activation of individual communities, as exemplified by the attractive offer of comprehensive urban revitalisation 'Bytom odNOWA' (Bytom reNEWed).

Whether the city will be able to cope with the post-dystopian conditions will be determined by a series of complementary measures, starting with wise, well-considered, and far-reaching decisions by the authorities, proper involvement of the Bytom community, the quality of new investments, and openness for innovation and new technologies. Of course, it will require substantial financial resources, but the city can count on the support of, among others, the Upper Silesian Metropolitan Union and the European Union.

The emergence of an increasing number of 'islands of success' is encouraging. They range from spectacular ones – such as the revitalisation of the 'cathedral of industry', i.e. the former Szombierki Heat Power Plant, the Krystyna Shaft, the renovation of the Silesian Opera, the Rozbark Dance and Movement Theatre, new sports and recreation facilities, golf courses, the largest outdoor sports climbing wall in Poland – to a much smaller but equally valuable initiatives, such as the 'colourful backyards' campaign.

However, scientists are cautious in their forecasts. In their opinion, the desired salvation from the dystopian reality will not come through the search for new utopian ideas and visions, but through the alleviation and improvement of significant social, economic and environmental problems.

Example of a run-down residential building in Bytom | Photo: Valentin Mihaylov

Photo: Patryk Pyrlik / Marshal Office of the Silesian Voivodeship

AUTONOMOUS BUSES

THE FUTURE OF TRANSPORT?

In December 2023, passengers in the GZM area could choose to take a ride on an autonomous bus. The bus, developed by a Gliwice-based company called Blees, is a level 4 autonomous vehicle according to the SAE classification. This means that it is equipped with technologies that enable autonomous navigation, but it still requires a person in the vehicle who is ready to take full control in case of an emergency. The bus was available at three locations: on the campus of the Silesian University of Technology in Gliwice, in the Valley of Three Ponds in Katowice, and in the Silesian Park in Chorzów. During the testing phase, Anita Pollak, PhD, Associate Professor, Łukasz Jach, PhD, Associate Professor, Anna Mucha, MA, from the Institute of Psychology of the University of Silesia in Katowice, and students Alicja Jurkowska, Ksenia Krotofil, Wiktor Łuniewski, Mateusz Mendrok, Janusz Pach, Ligia Skrzypczak carried out their study.

'Public transport in the city is one of the areas of cooperation between humans and autonomous systems that has been developing rapidly in recent years. The introduction of autonomy into transport raises many questions, such as how to encourage people to accept such a solution, how to organise supervision of the driving process, and how to prepare people to use this type of solution', states Anita Pollak.

In practice, these questions give rise to further questions: Who will be willing to pay for access to such solutions? Who – a person or a system – should decide whether to stop or continue driving? How can parents be persuaded to let their children travel to school on an autonomous bus?

During the course of the study, the psychologists performed a comprehensive analysis of the attitudes and beliefs regarding the tested vehicle. They looked at trust, level of interest in the technology, expectations regarding the effectiveness of the solution, as well as safety and comfort. In addition, they explored previously under-researched issues related to staying alert during the journey and the emotions experienced by the passengers. At the same time, a survey was conducted among people travelling by traditional means of transport. The researchers also examined aspects related to the screen inside the vehicle displaying information about its operation, prepared with the aim of increasing passengers' sense of safety. Ultimately, the screen is intended to replace the on-board operator.

The study responds to the growing interest in analysing the social and psychological factors influencing the willingness to accept and use autonomous buses. The results of this study are interesting because they concern passengers of autonomous vehicles, for whom the absence an active driver may favour a sharper awareness of stimuli, e.g. in terms of comfort.

The study involved 449 people who completed a survey after taking a ride on an autonomous bus and 159 passen-

Transport plays an important role in the Metropolis GZM. Travelling from one city to another for work or leisure is part of everyday life for many people in the GZM area who have to deal with heavy traffic, congested streets, and insufficient parking spaces and bus connections. Issues related to urban transport, logistics, and optimisation of movement within the metropolis are becoming increasingly important.

ed. Olimpia Orządała

Anita Pollak, PhD, Associate Professor
Institute of Psychology
Faculty of Social Sciences
University of Silesia
anita.pollak@us.edu.pl

gers who took a ride on a traditional bus. The participants' overall assessment of comfort and safety was positive. They also gave a favourable assessment of the necessity, legitimacy, and quality of the solution presented to them. The study did not reveal any differences in trust between the groups. This indicates that both users of the new and standard forms of transport felt that the vehicle would meet their requirements and keep them safe.

Participants who tested the autonomous bus were more interested in the technology and rated it higher compared to the ratings by users of traditional vehicles. The most positive responses came from people who often travel on foot, as well as younger and older drivers. Positive interest in the technology was associated with pleasant emotions (especially among men), while a negative assessment of the technology was associated with anxiety (among women) and boredom (among the entire group testing the autonomous bus). According to the technology acceptance model, the above-mentioned correlations favour an increase in the willingness to use this solution.

Interesting results were found in relation to where respondents' attention was focused – outside or inside the vehicle in which they were travelling. Taking a ride on an autonomous bus, which is dependent on the reliability of the systems used, directs the respondents' attention to the external environment. They make an effort and monitor possible obstacles that could affect the bus – unlike people travelling on a standard bus, who admitted that they are more involved in monitoring the situation inside the bus which could involve dangerous situations caused by other passengers.

There are many concerns about autonomous buses, and they relate to a wide variety of issues. Firstly, whether the autonomous system will be able to make the right decision in an emergency, e.g. in the event of a pedestrian crossing the road in front of the bus or a bird flying into the windscreen. Secondly, travellers are concerned that the remote operator may have difficulty taking control of the vehicle in the event of a malfunction, e.g. internet connection failure. Thirdly, there are doubts regarding legal liability for possible accidents. Fourthly, respondents also point out the issue of privacy and data security, as remote surveillance requires constant monitoring.

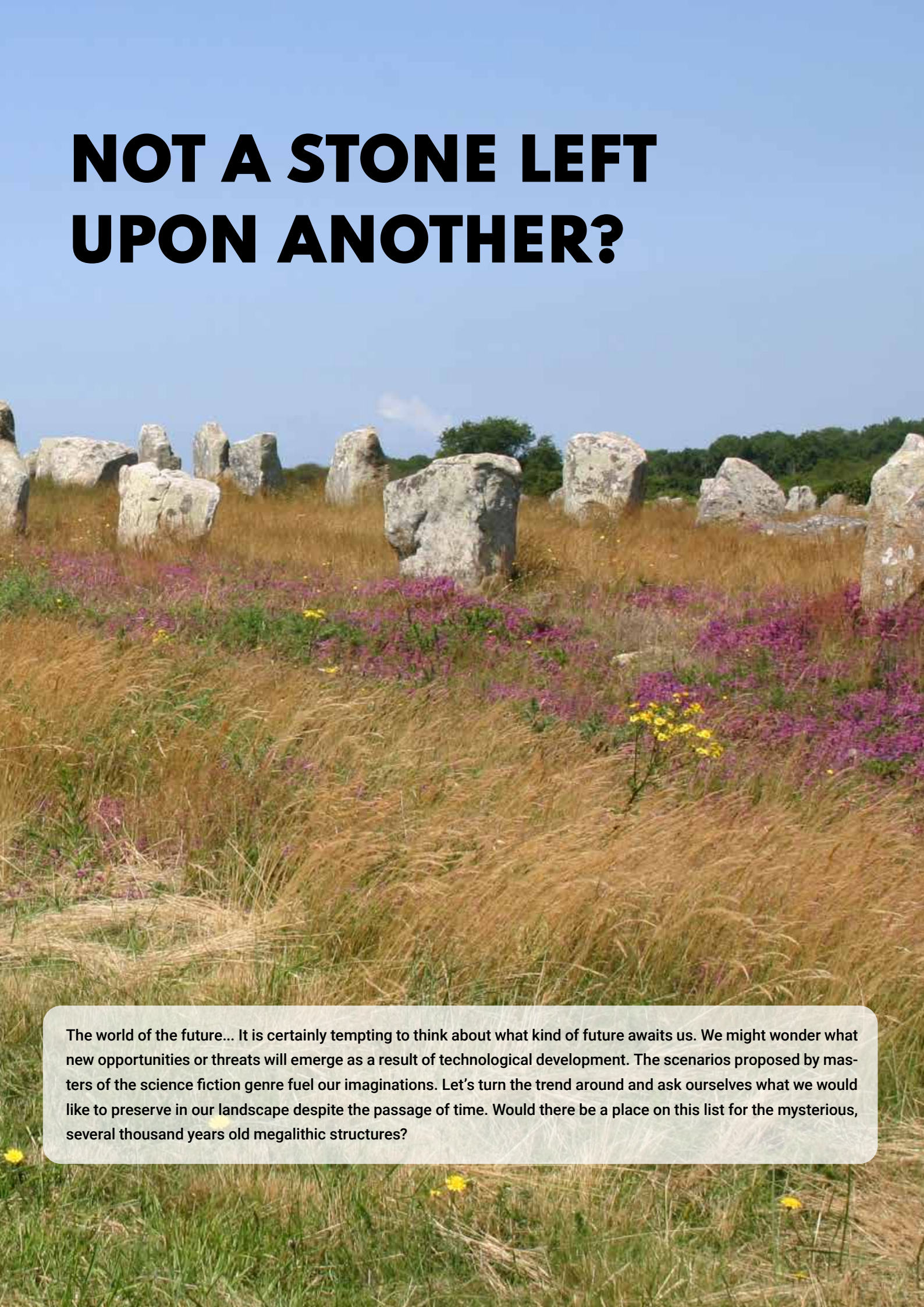
The survey data confirms that Poles are receptive to the idea of autonomous transport, which means that there may be less pushback against its introduction than is commonly believed. In addition to transparent legal regulations, it is important to clearly communicate the advantages and limitations of the technology and to gradually implement autonomous solutions in order to develop a sense of control among passengers and confidence that the system operates according to strictly verified safety standards.

Małgorzata Kłoskowicz, PhD

Anna Żemła-Siesicka, PhD, Eng
Institute of Earth Sciences
Faculty of Natural Sciences
University of Silesia
anna.zemla-siesicka@us.edu.pl

Menhirs in Carnac (Brittany, France) | Photo: Agnieszka Sikora

NOT A STONE LEFT UPON ANOTHER?



The world of the future... It is certainly tempting to think about what kind of future awaits us. We might wonder what new opportunities or threats will emerge as a result of technological development. The scenarios proposed by masters of the science fiction genre fuel our imaginations. Let's turn the trend around and ask ourselves what we would like to preserve in our landscape despite the passage of time. Would there be a place on this list for the mysterious, several thousand years old megalithic structures?

They are some of the oldest cultural artefacts in Europe, dating back to the late Stone Age. They were built from rough or roughly hewn stones. The megalithic structures in question are various types of objects whose history goes back to the Neolithic period. The simplest form of megalithic structures is menhirs. These stone pillars can form avenues or rows, as in Brittany, in the famous Carnac, where several thousand have been preserved. They can also take the form of cromlechs, or stone circles, the most famous example being Stonehenge, which attracts over a million tourists from all over the world each year. This group of structures also includes various forms of tombs, stone boxes covered with stone slabs called dolmens, gallery and passage graves, and, finally, burial mounds and tholos tombs in the form of large domed chambers. They can be found on many continents. They often shared a common function. They were mainly burial sites, but many also served worship and ceremonial purposes. For many, it was a taboo space. The place where the dead are buried is both forbidden and sacred even today. Perhaps this is why some elements of the megalithic landscape have survived to this day and have a chance to become part of the world of the future.

Examples of megalithic and later structures that refer to this idea can also be found in Poland. These are primarily tombs, burial mounds, and stone circles erected in the late Iron Age, particularly well-preserved in the north of our country. Many factors influence the condition in which they have survived to the present day and how they may look in the future. Let us consider various scenarios using the example of four such archaeological monuments preserved in Wietrzychowice, Leśna, Muszkowice, and Dolice. Anna Żemła-Siesicka, PhD, a landscape architect from the University of Silesia in Katowice, who has been researching megalithic landscapes years, tells us their story.

Wietrzychowice Cultural Park | Photo: Anna Żemła-Siesicka

WIETRZYCHOWICE AND THE POLISH PYRAMIDS

We begin our journey in search of preserved megalithic structures in the Kujawsko-Pomorskie Voivodeship. It was there, in Wietrzychowice, in the 1930s, that the Polish archaeologist Prof. Konrad Jażdżewski began his research into large boulders neatly arranged in rows. The stones turned out to be elements of a grave surrounds and today they are among the oldest architectural monuments in Poland. Although not as impressive as the pyramids in Egypt, they are more than 1,000 years older.

In the 19th century, the local population called them 'żale' or 'mogielniki' [lamentations or grave yards]. Some claimed that those were the tombs of giants who inhabited the Kujawy region in ancient times. It is not surprising, as a characteristic feature of this megalithic landscape was the elongated earth embankments, which could reach over 100 metres in length.

Five such tombs have been preserved in the vicinity of Wietrzychowice. By the 1930s, several dozen boulders used in the construction of the embankment had disappeared, most likely due to road construction. Only three of the five structures were intact. As soon as Prof. Konrad Jażdżewski understood what he was dealing with, he began to seek legal protection for the structures. The Kuyavian tombs were entered into the Poland's Register of Historical Monuments, and in 2006 the Wietrzychowice Cultural Park was established, providing a legal form of protection for these special architectural forms, sometimes referred to as the tombs of giants. Similar structures have been discovered in nearby Sarnów, where nine tombs have been identified.

'In the 20th century, excavations were carried out in both Wietrzychowice and Sarnów. These are examples of sites that have been reconstructed. Information boards were installed, tourist infrastructure was built, and cultural parks were created to ensure that the monuments would have a chance to survive in the future,' says Anna Żemła-Siesicka.

LEŚNO, OR STONE CIRCLES VS. A TORNADO

Evidence of ancient settlements can also be observed in Leśno, a Kashubian village in the Pomeranian Voivodeship. In the local Bory Tucholskie forest, there are several burial mounds and stone circles, 20 box graves, and 7 pit and urn graves from the Bronze and Iron Ages.

'Archaeological research was carried out there in the 20th century. The burial mounds and stone circles were reconstructed, and the tourist infrastructure was also taken care of, including the creation of several interesting themed paths', the architect explains.

On the night of 11 August 2017, a storm passed through the Bory Tucholskie area, wiping thousands of hectares of forest off the face of the earth. The works to restore educational and tourist infrastructure in this area were completed in 2020, with one of its elements being the Kręgi Kamienne (Stone Circles) cultural trail in Leśno.

'The storm, although tragic in its consequences, revealed the location of the historical objects. The forest disappeared, revealing distant views and allowing us to imagine what the burial ground from several thousand years ago might have originally looked like. This experience of the past has become even more authentic', emphasises the researcher.

MUSZKOWICE AND BURIAL GROUNDS HIDDEN DEEP IN THE FOREST

Muszkowice is a small village located in the Lower Silesian Voivodeship. About a kilometre from its northern border, in an old beech forest, there are burial grounds with Neolithic long tombs. They were entered into in the National Register of Archaeological Monuments [Krajowa Ewidencja Zabytków Archeologicznych] in 1984.

It is an interesting example of a place where chamberless tombs can still be seen in excellent condition. As a result of subsequent research, several dozen sites with long tombs and medieval circular burial mounds have been identified in the area.

'These unique and monumental structures are difficult to spot with the naked eye. There is no tourist infrastructure there. Finding the burial grounds is not an easy task. They are situated in a densely forested area and it is precisely the reason why they have been able to survive in such excellent condition until today', says the researcher.

Are they monumental structures? Certainly. However, only invasive modern scanning or excavations can reveal their unique structure and confirm it. What is visible to the naked eye is not at all what it seems. It takes some effort to find them, and in the end, we can only see... long hills covered with trees and boulders sticking out here and there in the forest.

Sarnowo Cultural Park | Photo: Anna Żemła-Siesicka

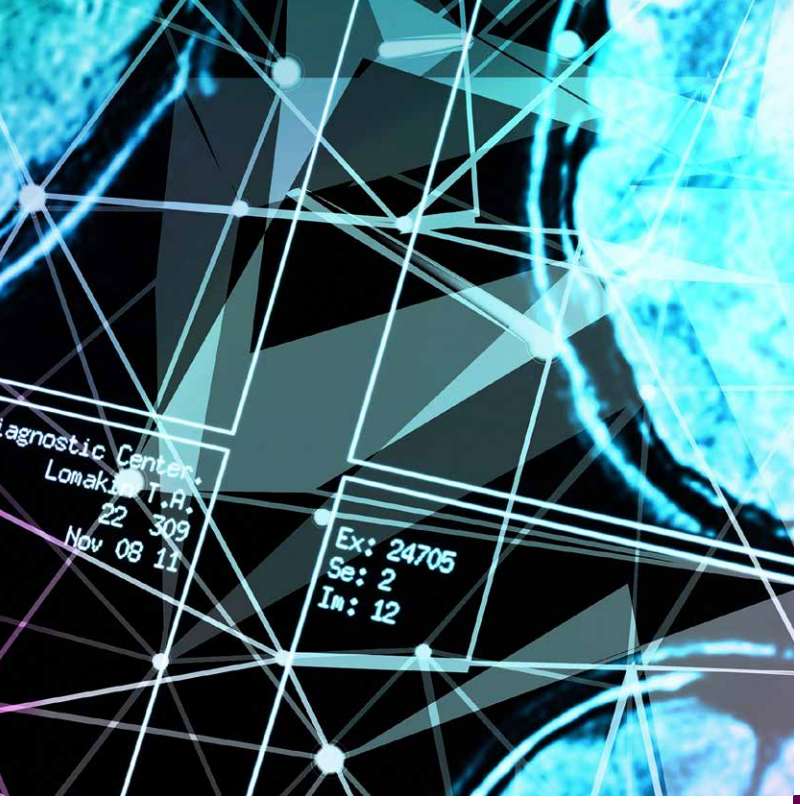
DOLICE AND THE GATES OF TIME

'I visited these and many other places in Poland and Europe where traces of megalithic landscapes have been preserved. Standing there, I knew that I was dealing with authentic artefacts of ancient cultures from several thousand years ago', says the researcher. However, what she observed differed from place to place. The objects in Muszkowice have been preserved because they were well-hidden in an old beech forest. In Wietrzychowice, valuable monuments have survived because measures were taken to grant them legal protection. In Leśno, megalithic elements were reconstructed twice due to the effects of an extreme natural event – a storm. All this to preserve them for future generations.

'Certainly, it is important to provide adequate tourist infrastructure, but only in such a way that the place does not lose its historical value. In my opinion, the architectural solutions used in Dolice near Stargard Szczeciński are worth taking a closer look at', emphasises Anna Żemła-Siesicka.

Dolice is another place where you can see numerous Neolithic objects. To promote the archaeological heritage of the region, the 'Wrota Czasu' [Gates of Time] open-air archaeological museum was built in Polana Wiśniowa in 2012, just a few hundred metres from the preserved tombs. It includes replicas of a megalithic tomb with a skeleton buried inside, as well as stone burial mounds from the Bronze Age.

Such an initiative serves, first and foremost, to educate. The information materials available there allow for a better understanding of the distant past and can be more attractive to tourists. The replicas stimulate the imagination. However, if you would like to experience the place in all its authentic self, you can go deeper into the forest to look for traces of the activities of the people who lived here several thousand years ago. Will those traces survive for a few thousand more? Only time can tell.



Agnieszka Sikora, PhD

Karina Maciejewska, PhD, Associate Professor
Institute of Biomedical Engineering
Faculty of Science and Technology
University of Silesia
karina.maciejewska@us.edu.pl

Karina Maciejewska, PhD, Associate Professor is the head of a research group at the Institute of Biomedical Engineering of the University of Silesia that deals with the processing and analysis of biomedical signals in order to better understand the psychophysiological activity of the human nervous system and its reactions to the environment. The researchers focus on studying the electrical activity of the brain and other biomedical signals. The application of the latest achievements in the field of biomedical engineering, i.e. virtual reality and mobile brain and body imaging, allows researchers to contribute to the development of cognitive neuroscience, thanks to which we can better understand how human cognitive processes work in the natural environment, as well as improve specialised tools for the analysis of biomedical signals.

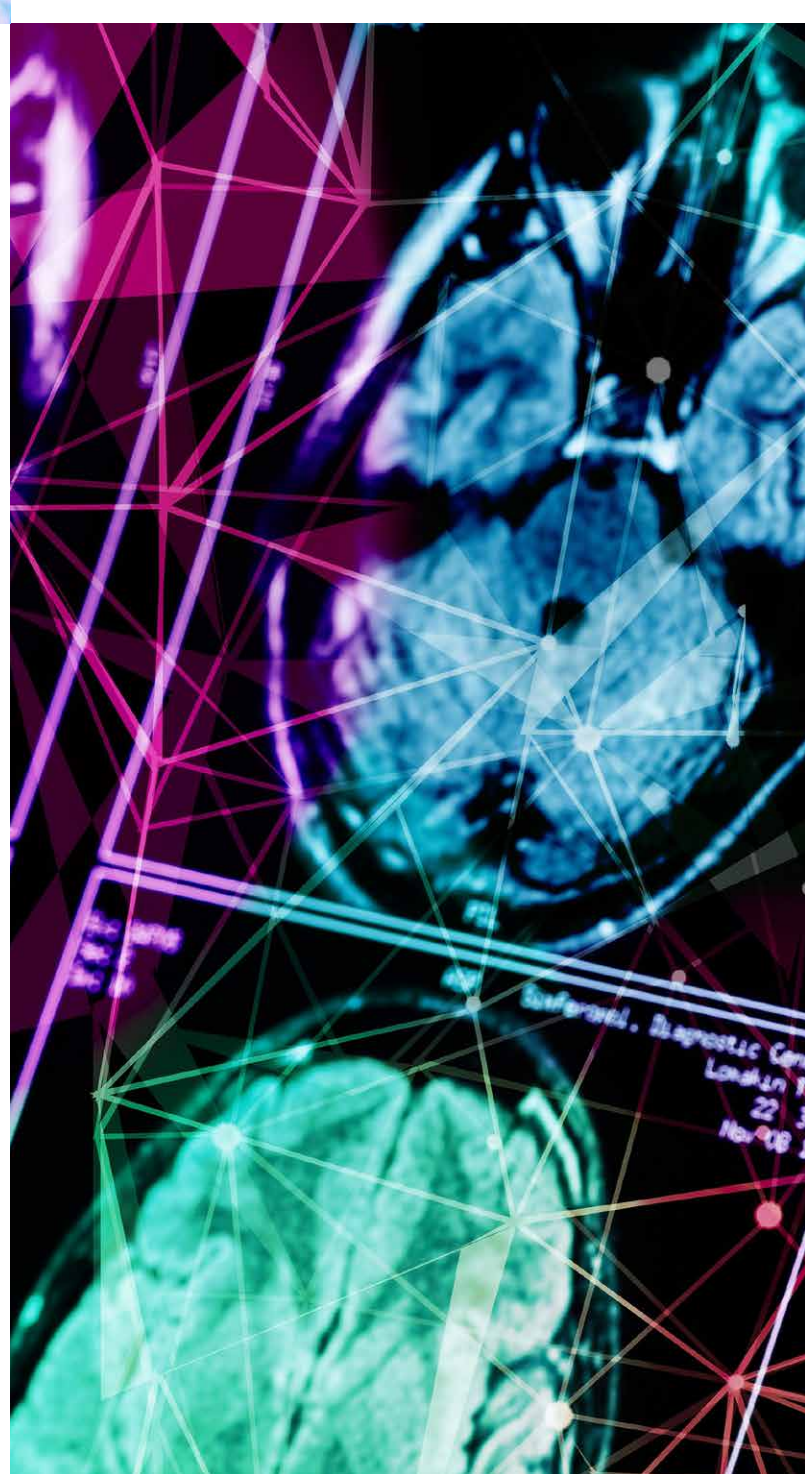
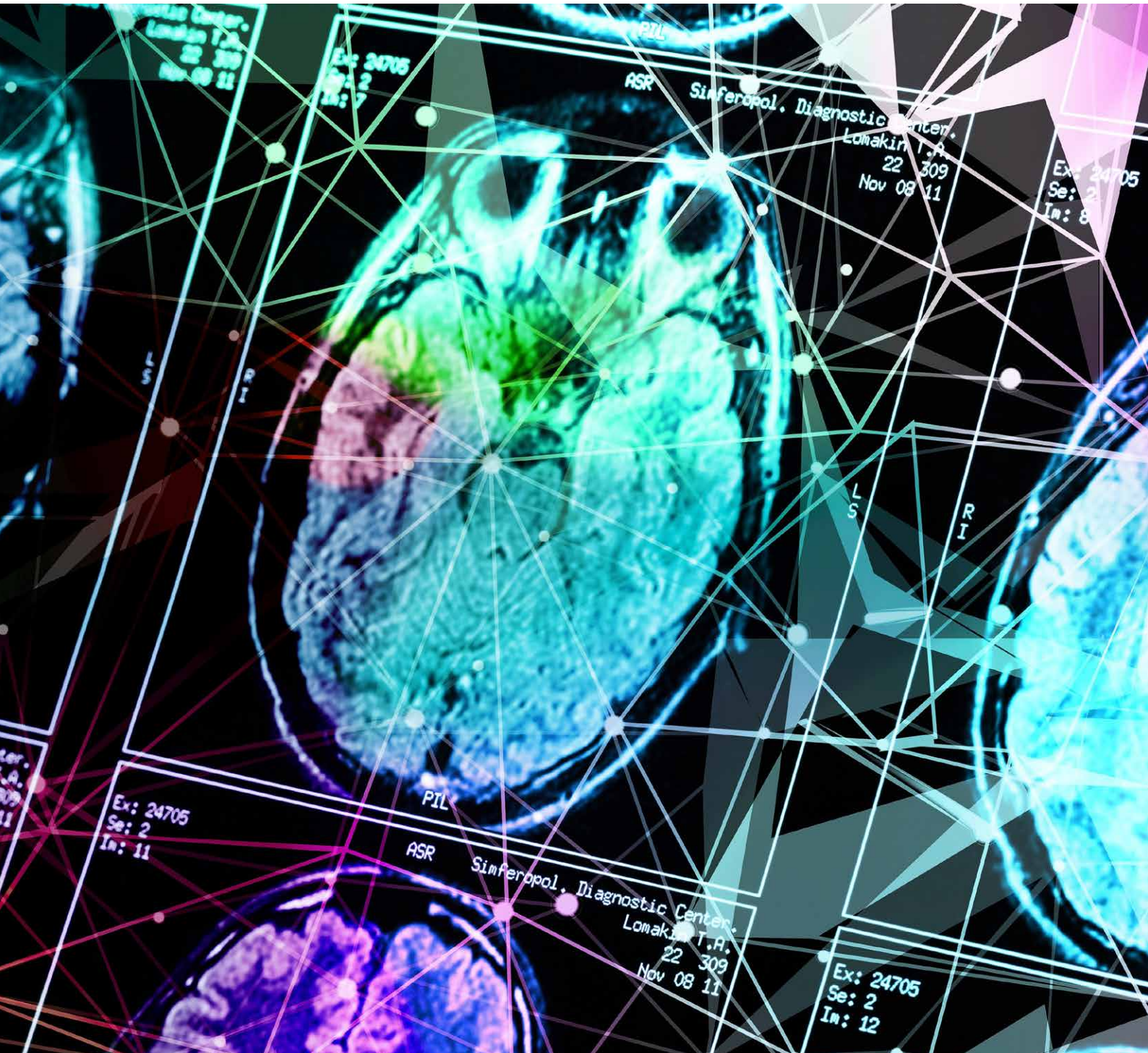


Photo: Freepik

HOW **BRAIN RESEARCH** WILL CHANGE THE FUTURE OF HUMANITY



NEUROSCIENCE AND BIOMEDICAL ENGINEERING

It is a broad interdisciplinary scientific field that studies the nervous system with a particular focus on the brain. It combines many scientific disciplines – from biology, neuroscience, chemistry, physics, biomedical engineering, to computer science and even psychology, humanities, philosophy and linguistics. Neuroscientists analyse the processes responsible for thinking, memory, interactions with other people, emotions, and decision-making. Another important area of research is the search for causes and treatments for neurological diseases. The nervous system can be observed and analysed using various technological solutions, e.g. magnetic resonance imaging (MRI) and electroencephalography (EEG). Neuroscientists study the nervous system on many levels: individual ion channels (proteins that are located inside cell membranes), neurons (nerve cells), tissues, organs and on a systemic level, i.e. the whole organism; social neuroscience deals with interactions with other people.

Scientists are trying to find out how various cognitive processes work in a healthy organism, e.g. short-term and long-term memory and the attention process, which are crucial for human survival and adaptation to the environment.

'In the attention process, the human brain is able to choose, i.e. to select and isolate specific information from among all the others that reach it. These include billions of stimuli related to, among other things, language processing, language comprehension, spatial orientation, perception, etc. Cognitive processes can be studied using behavioural measures – an experiment is set up in which a volunteer answers questions, and scientists study the answers or the speed of response to the questions and then interpret the results. We, on the other hand, try to explore the topic of cognitive processes of the human brain using biomedical signals, which are objective and more sensitive because they directly measure the activity of the brain, muscles, heart, or eyes', explains the researcher.

BIOMEDICAL SIGNALS

Biomedical signals are measurable physiological signals from the human or animal body that reflect the functioning of biological systems. They can be electrical, mechanical, chemical, and thermal and are used in diagnostics, health monitoring, and scientific research.

One of the most basic and frequently studied biomedical signals is the measurement of the functioning of the central nervous system by analysing the electrical activity of the brain (EEG).

EEG and VR system tested by a team member
Photo: Agnieszka Sikora

'This is the main method we use, along with peripheral signals, which measure the activity of other organs controlled by the nervous system. It allows us to learn more about how the brain, nervous system and the entire body function in a specific situation or in response to a certain stimulus,' explains the researcher.

Another biomedical signal studied is electrocardiography (ECG). This type of research involves recording and analysing the electrical activity of the heart. The ECG measures the changes in electric potential generated during the contraction and relaxation of the heart muscle. Keep in mind that the heart does not actually beat. It is a mechanical process during which the heart muscle contracts and pumps blood into the blood vessels, but it is closely related to electrical activity, since it is electrical impulses that initiate and coordinate the contractile movements of the atria and ventricles, i.e. they initiate the depolarisation and repolarisation of the heart muscle.

Another biomedical signal that scientists use is the respiratory signal. This involves recording and analysing such breathing parameters as frequency, depth, and regularity. A special belt is placed on the chest to record its movements during inhalation and exhalation. This allows scientists to track the subject's breathing patterns.

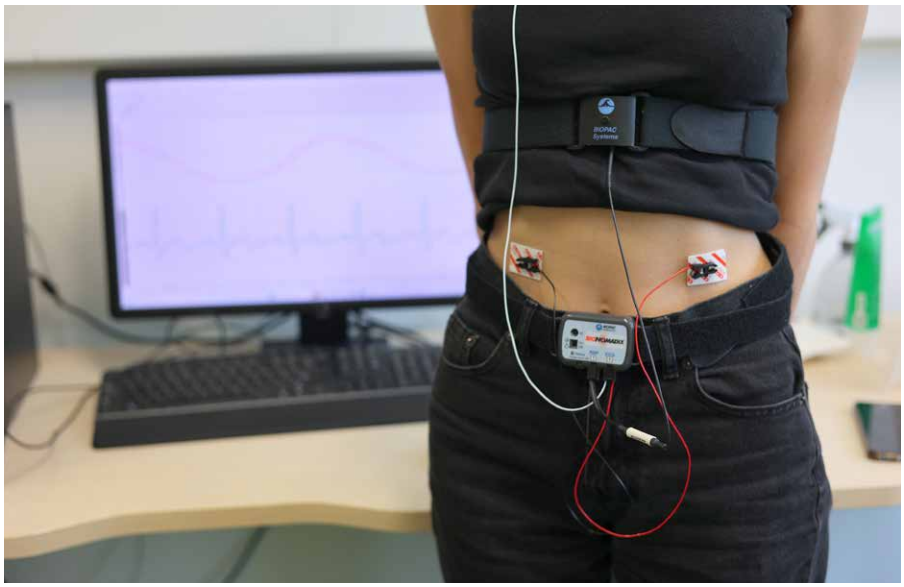
Another important signal is electromyography (EMG), a test that records the electrical activity of muscles, which makes it possible to analyse neuromuscular connections and diagnose certain diseases, such as neuropathies. EMG is often associated with rehabilitation procedures and sports examinations, but it is also used in facial muscle testing. We know that facial expressions are linked to a person's psychophysiological and emotional state. By observing the face, we can recognise which muscles are activated and thus contribute to a specific facial expression and the emotions behind it. This allows us to recognise certain illnesses or states of agitation. Artificial intelligence is increasingly being used for this type of analysis, as it can recognise human facial expressions and classify grimaces. However, many changes cannot be seen with the naked eye, which is why biomedical signals have the advantage of detecting even very small activations.

Electrodermal activity (EDA) is particularly interesting. It measures changes in the electrical conductivity of the skin, which are triggered by sweating. Sweat gland activity is controlled by the sympathetic nervous system and is,

therefore, closely linked to emotional reactions, stress, and arousal. Of course, sweating is also dependent on external conditions, but these are controlled during testing. The electrodermal reaction is used in so-called polygraphs, or lie detectors. However, this type of research should be approached with a great deal of distrust so that we can avoid drawing too far-reaching conclusions. Therefore, when using EDA measurements, other biomedical signals are often used as well, e.g. eye movement tracking – the so-called electrooculography (EOG). This allows for a more comprehensive analysis of physiological and cognitive responses, especially with regard to emotions, attention, and information processing.

Another very important neuroscience test is functional magnetic resonance imaging (fMRI) – a technique that allows to identify brain areas that activate during the test. It uses blood flow changes in the brain as an indicator of neuronal activity.

Positron emission tomography (PET) is also used in neuroscience. This imaging technique allows the evaluation of metabolic and functional processes in the body using radiation emitted by radioactive substances (markers) that are introduced into the human body. However, these last two methods are characterised by a poor temporal resolution. It means that the measured signal only appears sometime after the stimulus, and since we are interested in studying the dynamics of the brain's information processing, biomedical signals, such as EEG, have a huge advantage here. Not only do they allow biopotentials to be measured in milliseconds (i.e. thousandths of a second), but the greater availability, no need for a massive infrastructure, and the rapid development of technology enabling their miniaturisation and portability allow us to explore the secrets of the human brain in a more natural environment.



Wireless biomedical signal measurement system tested by a team member | Photo: Agnieszka Sikora

MOBILE BRAIN AND BODY IMAGING (MOBI)

In standard examinations, the person has to be examined in a stationary position. They sit in front of a monitor, have to look at the centre of the screen without moving their eyes, which can cause artefacts, not move their arms and legs, breathe freely but not too deeply, not move their tongue, and not clench their jaw and neck muscles. Then they react by pressing a button when they see a certain group of stimuli. All of this introduces a number of limitations.

Mobile brain and body imaging makes it possible to study neurophysiological processes in a more natural, everyday settings, even outside the laboratory or hospital. Its main purpose is to monitor brain, muscle, heart, and other bodily functions, as well as to track eye and body movements in a dynamic environment, e.g. during movement, work, exercise, sleep, and interaction with the environment, objects, and people. Lightweight, portable sensors are used instead of large, stationary devices. They can be worn as belts, armbands, caps, vests, and other small devices attached to the skin. Data is collected in real time and transmitted wirelessly to an analysis device (e.g. a phone, tablet, or computer).

In the future, thanks to developments in biomedical engineering, brain and nervous system research will certainly push towards an increasingly accurate understanding of brain mechanisms, disease diagnosis, and the development of modern treatment options. Noteworthy among the key areas of development is the intensification of work on brain-computer interfaces (BCI). It is a dynamically developing field of neuroscience and biomedical engineering that enables direct communication between the brain and external (electronic) devices. They already help people with disabilities to communicate with their environment (as in the case of the famous physicist Stephen Hawking) or to regain some motor functions. Brain signals can be used to control the movements of prostheses, virtual cursors, wheelchairs, robots, and computer applications. It is safe to assume that Neuralink technologies will also continue to develop, i.e. implants that enable their users to communicate with a computer or to control devices with thoughts. In the future, interfaces may allow us to 'expand' our memory and improve other cognitive abilities.

Tomasz Płosa

CAN A COMPUTER BE AN ARTIST?

ALGORITHMS, EVOLUTION AND THE FUTURE OF ART

At first glance, art and evolutionism do not seem to have much in common, maybe even nothing at all. However, it turns out that the use of mechanisms associated with the theory of evolution can influence artistic activity in a very interesting and non-obvious way and open up interesting perspectives for the future of art. The role of a 'mediator' between evolution and art is assumed by algorithmics, specifically evolutionary algorithms.

Imitation of Vincent van Gogh's painting *The Starry Night* generated by an evolutionary algorithm created by Krzysztof Para, a student of computer science at the University of Silesia

Prof. Urszula Boryczka
Institute of Computer Science
Faculty of Science and Technology
University of Silesia
urszula.boryczka@us.edu.pl

It is a class of computational methods developed in the 1960s – and continuously improved since then – inspired by mechanisms found in biological evolution, such as crossbreeding, natural selection, and mutation. Evolutionary algorithms are the subject of research conducted by Prof. Urszula Boryczka from the Institute of Computer Science at the Faculty of Science and Technology of the University of Silesia.

'Genetic algorithms, pioneered by the American scientist John Henry Holland, are the oldest and relatively the simplest to describe in terms of their functionality. The way of coding the optimisation problem – its most effective solution is always the task set for the algorithm – is based on the binary system, using which we can already write down human chromosomes. On the other hand, in genetic programming, popularised by John R. Koza, we operate with structures known in computer science as "trees", i.e. multi-level dependencies between the characteristics of a solution to a problem. We can modify them by removing certain parts, just like cutting branches off a tree', explains Prof. Boryczka.

Evolutionary algorithms also include: scatter search, evolutionary programming, neuroevolution, and evolutionary strategies, which were used by the Swedish artist Roger Alsing to create the Polygonal Mona Lisa – with the face of Gioconda consisting of tens of thousands of triangles generated after entering specific parameters and then filtered according to their similarity with the original.

'In 1968, two German scientists, Ingo Rechenberg and Hans-Paul Schwefel, worked on optimising the shape of aeroplane wings. When mathematical solutions did not bring satisfactory results, they got inspired by genetics, or more specifically, by subjecting genes to slight mutations based on standard deviations – and this is how evolutionary strategies using mathematical statistics were created', explains the scientist and emphasises how important and inspiring is the analogy between the self-improvement of algorithms encountering an optimisation problem and the ever-improving adaptation of living organisms encountering environmental challenges.

Art generated by artificial intelligence using evolutionary algorithms is met with mixed reception, and the validity of such an approach is often questioned. However, Prof. Boryczka is convinced that in the times of a general creative crisis, as diagnosed by today's humanities, it can provide an invaluable stimulus for the development of humanity in this area. Above all, the study of algorithm-generated art directs the efforts of scientists towards the modelling of the creative process. The mathematical framing of this process would be considered a milestone on the road to the creation of artificial emotional intelligence, which in turn could give rise to empathetic devices, simulating the behaviour of a doctor or carer for lonely senior citizens. There is, however, one serious problem.

'We are still unable to mathematically describe the variable that represents the viewer's impression of a given work. For one person, generative art will be better the more closely it imitates the original, and for someone else, the opposite will be true – the more it deviates from the original piece of art. As the developers of the programme, we would have to use multi-criteria optimisation, assigning a different weighting for each type of evaluation, but in all likelihood, there'd be so many of them that they would quickly become unmanageable', explains the IT specialist from the University of Silesia.

Evolutionary theory of art (evolutionary aesthetics) offers an interesting perspective on the nature of the creative process. According to this relatively young concept, art as a human activity developed as an adaptive mechanism, not by exaptation – a process that is, to some extent, peripheral to evolutionary development. Going even further, art is, therefore, a form of lifelong adaptation of the individual, and specific artistic trends and styles are in fact civilisational needs.

'If we stick to the exaptive option, we will not be able to avoid the need for a two-track method of evaluation when constructing a model of the creative process. Even if we introduce aesthetic and similarity metrics into the algorithm, we will still need an "expert" opinion to determine whether a given work of art won't be frustrating for the audience, for example. This leads us towards co-creative systems in which humans and machines work together as equals', warns the researcher.

Prof. Boryczka does not share the fear that sentient and self-aware robots could one day turn against humans. In her opinion, the development of artificial intelligence will rather set the desired direction of progress for our species, also with regard to artistic activity (although art is likely to change as the computer becomes its primary tool). The ability to simulate spontaneous (emergent) phenomena in the creative process – even at a very basic level – would open up tremendous opportunities for further development of science.

ARTIFICIAL INTELLIGENCE

The development of technology and artificial intelligence is progressing at a tremendous pace. Modern solutions are constantly transforming our everyday lives and not everyone can keep up. On the one hand, older people who have limited access to technological services are having a hard time. On the other hand, children and young people are falling victims to modern trends and are becoming immersed in the digital world to such an extent that living completely offline seems nearly impossible to them. What are the benefits of the digital transformation, and are we capable of protecting ourselves from the risks?

NEW TECHNOLOGIES

HOW TO USE THEM WISELY?

Katarzyna Suchańska

Tomasz Kopczyński, PhD, Associate Professor
Institute of Pedagogy
Faculty of Arts and Educational Science
University of Silesia
tomasz.kopczynski@us.edu.pl

Tomasz Kopczyński, PhD, Associate Professor, from the Faculty of Arts and Educational Science of the University of Silesia in Cieszyn, conducts research on new technologies and their use in education. His interests also include neurodidactics, and one of the subjects he teaches is new technologies in education and upbringing.

'Nowadays, we can find many applications of technology and artificial intelligence in education. We could start with the e-learning platform Moodle, which has its fair share of both supporters and opponents, then point to Google Classroom, Microsoft Teams and other platforms for online meetings and education, which began to develop rapidly during the pandemic. One programme that has received a lot of praise is Duolingo, a mobile app that helps you learn a foreign language in a structured way'.

The scientist also lists more elaborate platforms such as Khan Academy's Khanmigo, which uses complex algorithms to personalise the learning process, and VR headsets – devices that allow for an immersive learning experience in the form of virtual conversations (Mondly VR – a language learning app allowing users to talk with AI and Maya by Sesame AI – a free and recently popular AI conversation partner), travel (Brink Traveler) and interactive biology classes (Human Anatomy Puzzle and eduLabVR).

Despite such a rich educational programme, which undoubtedly facilitates learning and makes it more attractive for people of all ages, there is a risk of missing out on the world of books, encyclopaedias, and dictionaries. The scientist claims that this is simply an unavoidable generational shift.

'A few decades ago, children did not have access to such forms of entertainment as computer games. They spent their free time socialising with their peers, creating games based on their imagination and shared experiences. In the past, life was centred around activities done outside the home: in playgrounds, orchards, rug-beating stands, and on the streets. Today, we have closed ourselves off in our homes and children in their rooms and digital spaces', notes Tomasz Kopczyński.

The burden of upbringing, regardless of the times, has always rested on the parents because children learn most effectively through imitation. It is difficult for modern parents to be the providers of all entertainment, although it is up to them to plan and organise family time. Unfortunately, the working style of modern parents often forces them to be constantly 'on call', which means they spend a lot of time in front of their computer screens outside of working hours. However, people are beginning to realise the importance of work-life balance, which is often the answer to the question: what is more important to me?

New tools often give rise to new professions. Over time, we can observe a significant increase in the number of ways to earn a living by taking on such roles or specialisations as youtubers, influencers, streamers, and gamers. Tomasz Kopczyński says that these are not professions that would generally bring any significant social benefits (e.g. the popularity of educational and scientific channels vs. entertainment channels). Although older generations do not understand these professions, it does not mean that the world is heading in the wrong direction or that technology is clouding our minds.

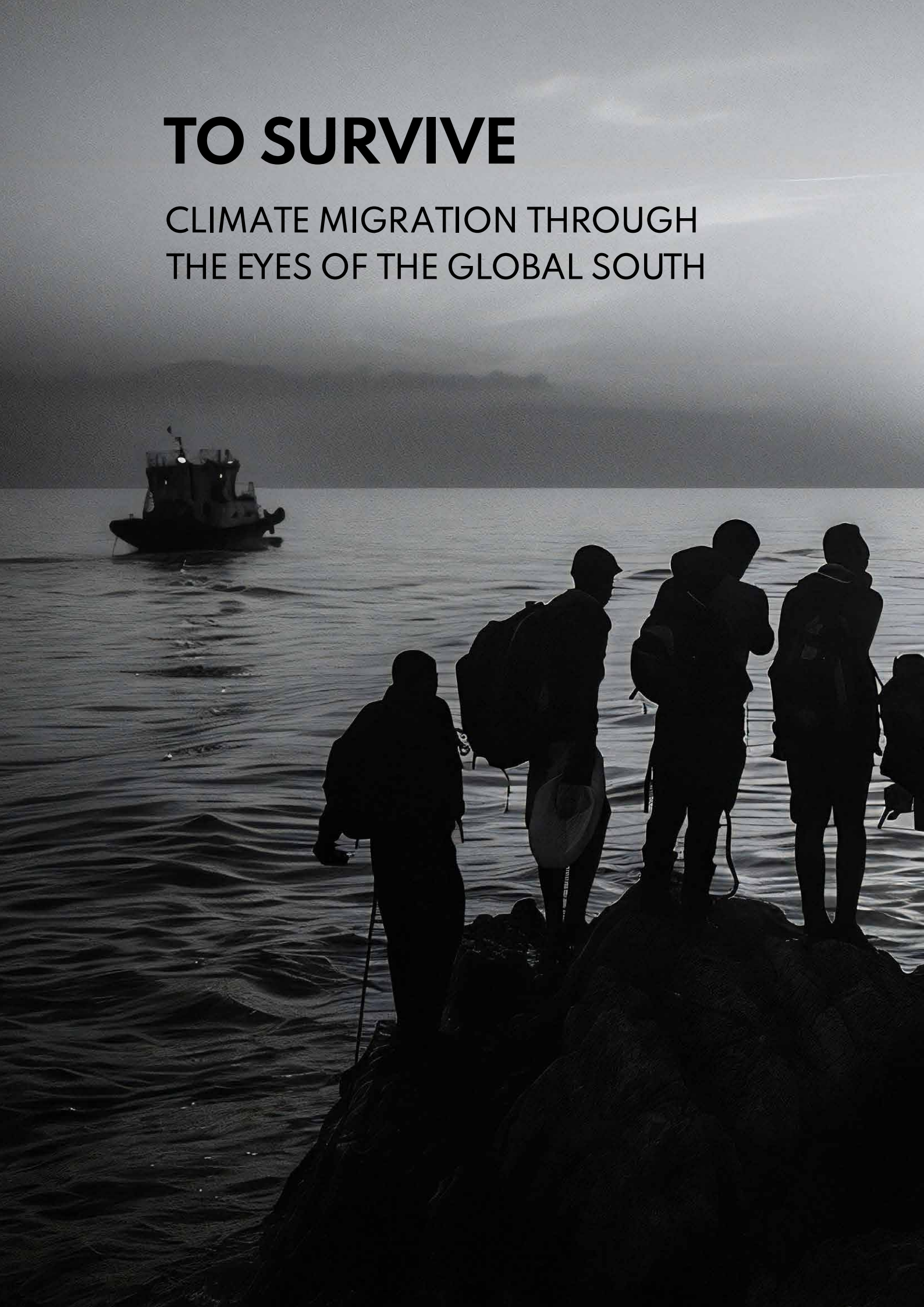
'First and foremost, the development of technology and the virtual world is the result of human ingenuity and imagination. These days, it is hardly possible to find areas that have not benefited from it. We see it not only in education and science but also in art. Thanks to the development of AI, it is now possible to create beautiful visualisations of the ancient or prehistoric worlds based on objects discovered during archaeological expeditions. Medical students are using this kind of technology to see what individual organs look like and to carry out interactive surgery with the aim of becoming specialists in their field', the scientist explains.

The development of artificial intelligence certainly brings many benefits in various areas of our lives. It is difficult to answer the question of what the future holds and which direction technology will take. Certainly, we should be aware of the risks it carries and try to protect ourselves and young technology users from them.

'I think there are reasons to believe that the digital world is developing for the good of humankind and that, by sensibly using the advantages of new technologies, we can achieve many great things that will not only make our everyday lives easier but also support the development of science, innovation, and many other areas of our society', concludes Tomasz Kopczyński.

TO SURVIVE

CLIMATE MIGRATION THROUGH THE EYES OF THE GLOBAL SOUTH

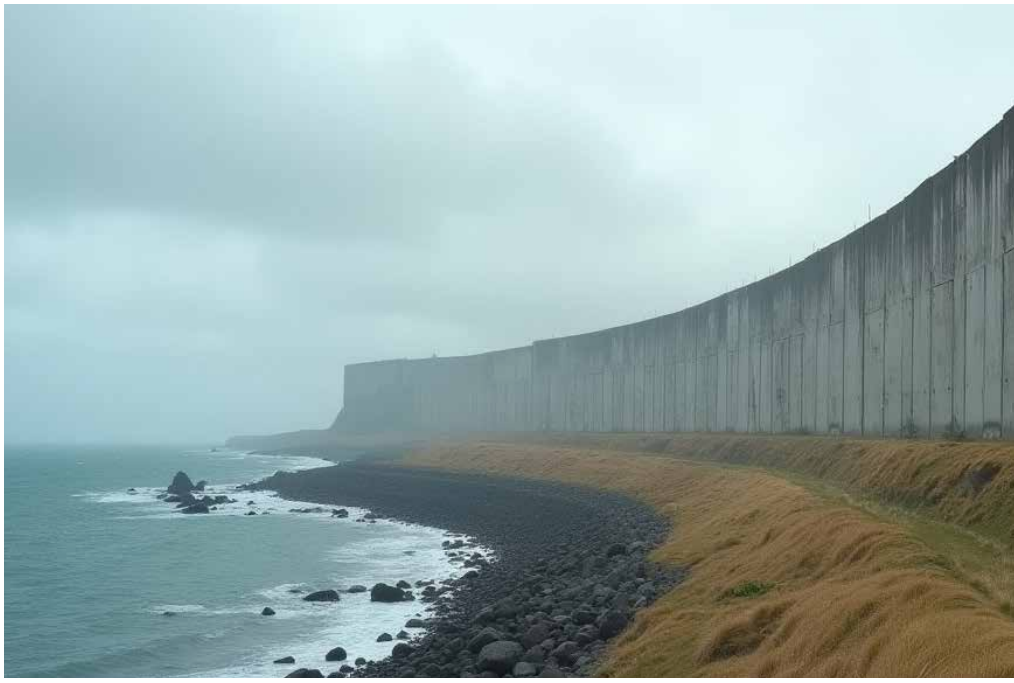


Wanderlust is part of human history. *Homo sapiens* owe it their greatest triumph. After leaving the cradle of humankind in Africa, we have reached every other continent and even set foot on the Moon. In the 21st century, however, we are still preoccupied with matters here on Earth, where increasing climate change is forcing many people to leave their homes. How we approach the issue of climate migration today will determine what kind of world we will live in tomorrow.

Anthropogenic climate change, caused primarily by the countries of the so-called Global North, hits the Global South the hardest. Still, we don't really notice the voice of the latter group as much, even though it is important for us to lend them an ear as they can offer us a completely different, yet valuable perspective on many issues. In their research, Ewa Macura-Nnamdi, PhD, Associate Professor – an English studies expert – and Magdalena Malinowska, PhD – a Romance studies expert – from the Faculty of Humanities of the University of Silesia in Katowice, examine the perspectives of this often overlooked part of the world's population. The researchers are combing through English and French-language works to find out how authors living primarily in Africa and the French Antilles deal with the consequences of climate change and environmental pollution. It is mainly a study of literature but also includes film and other art forms.

Weronika Cygan-Adamczyk

Will Europe have to build a wall around itself to face the incoming flood of immigrants? | Photo: AI



DISPLACEMENT RATHER THAN **MIGRATION**

Ewa Macura-Nnamdi notes that when talking about population movements caused by climate change, instead of migration, it is better to refer to the much more appropriate and significantly broader concept of displacement. The former also carries a certain baggage, often negative, especially when it comes to climate or economic migration. Western (American and European) cultural works play a significant role in perpetuating this impression.

'They often depict climate refugees as wild hordes of people, mostly flooding into Europe, attempting to escape from endangered parts of the world that are usually neither geographically defined nor defined in any other way. These are often sheer masses of people about whom we know absolutely nothing. They are supposed to represent danger and threat. Europe is, therefore, something of a citadel that needs to be walled off and protected against the advancing masses', says the English studies expert, and points to the British writer John Lancaster's book *The Wall* (2019) whose titular wall protects England from foreigners and Alfonso Cuarón's film *Children of Men* (2006) based on the book by the same name by P.D. James (1992), where the English also have to protect themselves from a deluge of refugees attempting to enter their country.

In the context of climate change, the term displacement can refer not only to horizontal migration to distant or near places but also to vertical migration to higher terrain or below ground. More often, it also takes into account smaller-scale relocation, which can involve moving to a different place within the same country or region.

One of the more imaginative visions of such climate-change-driven relocations is presented in the short film *Pumzi* (2009) by Kenyan director Wanuri Kahiu. The plot takes place in the distant future when the world is struggling for water after the third world war, and the inhabitants of the eastern regions of the continent decide to move underground.

Researchers from the University of Silesia also point out that the theme of adaptation and determination to survive in new circumstances is prevalent in the works of artists from the Global South.

'It is more about adaptation than escape, and if anyone does escape, it is not to a place thousands of kilometres away but to neighbouring areas', explains Ewa Macura-Nnamdi.

In fact, there are already some significant global displacements taking place right now. In the next few years, Indonesia intends to move its capital from Jakarta, which is at risk of flooding, to Nusantara. Sinking land – a result of rising sea levels due to global warming – is an increasingly urgent threat to many island nations, especially in the Pacific. Their citizens will have to move somewhere – will they have to rely on being granted asylum by other countries?

AFRICANFUTURISM AS AN ANSWER TO **AFROFUTURISM**

Our perspective on the global South, a region less resilient to climate change, is gradually shifting, but it's still a slow process. Even if we are introduced to these countries through popular films or books, we still risk adopting an American- or European-centric view. Let's take a look at the Marvel film *Black Panther* (2018), which takes place in Africa, but the highly developed country of Wakanda that we visit does not actually exist. Also, the story does not particularly focus on the continent itself or the connections between the nations there. The fact that the film was made in the US means that even though it features African citizens, it is not a truly African perspective.

Magdalena Malinowska emphasises that it is easy to distinguish between Afrofuturism and Africanfuturism on this basis. In the case of Afrofuturism, we are talking about a trend that grew out of American soil and has close ties to African-American culture. However, the name can create the misleading notion that it refers to the experiences of Africans, hence why Nnedi Okorafor (one of the most renowned authors of this genre) created the term Africanfuturism, deliberately written as a compound word. Contributors to this genre finally take into account the African context and the relations between the countries in the African continent. However, it is still possible to find common elements linking both perspectives.

While the future in Western science fiction often reproduces existing power relations, the authors of the Global South aim to shift the focus in the world of future global geopolitics. There is a palpable sense of optimism, a certain amount of hope that a better future, free from inequality, is possible and that a way out of the ecological crisis can be found', explains Magdalena Malinowska.

This perseverance, as expressed by the communities portrayed by said artists, does not always have to concern humans as such. In the novel Semences, the last volume in the climate trilogy by French writer Jean-Marc Ligny, after a period of human domination, with humans having been reduced to micro-societies, the planet is ruled by ants, which have evolved to become intelligent and have gained a significant advantage over the last representatives of *Homo sapiens*.

'If humanity were to become extinct, it would not necessarily spell the end of the natural environment. By adapting to these changes, the Earth could create space for something completely new to emerge', adds the Romance studies expert.

Although the media tend to focus on animal and plant species that are dying out, environmentalists and biologists also report on organisms that are still winning the race to adapt to climate change and are even expanding their habitats (e.g. the invasive jellyfish *Periphylla periphylla* off the coast of Norway).

Migrations can therefore involve not only a physical change of location but also the passage of time – transformations that occur not only over a number of years but over entire eras. Connections between them are sometimes shown in a surprising way, such as in the form of an unusual union of a pro-ecological message with the use of long-abandoned rubbish. This is how photographer Fabrice Monteiro (born in Belgium as a descendant of Brazilian slaves, currently living and working in the capital of Senegal, Dakar) decided to show the scale of harm done by environmental pollution. He did so by presenting waste in an aesthetic and almost hypnotising way. His photo series with the suggestive title *The Prophecy* shows otherworldly, sometimes monumental and sometimes terrifying figures made from a combination of waste and elements of the natural environment.

We do not know what our planet will look like in a few years, let alone a few centuries. However, we should make an effort to leave it better off than it is now. It can only be done if we also try to better understand the circumstances of other communities. Let's begin by looking at the world through their eyes, reading their literature, and experiencing their art.

Ewa Macura-Nnamdi, PhD, Associate Professor
ewa.macura-nnamdi@us.edu.pl

Magdalena Malinowska, PhD
magdalena.malinowska@us.edu.pl

Institute of Literary Studies
Faculty of Humanities
University of Silesia

NO RISK

ON THE FUTURE OF ROMANTIC RELATIONSHIPS

Will there still be room for romantic relationships in the future and what will they look like? Will robots replace our life partners? Let's explore this issue toghether with Ania Malinowska, PhD, DLitt, Associate Professor, a researcher of new technologies in the field of robot culture and semiotics of emotions, a clinician in the field of therapeutic hypnosis, and a co-founder of the Centre for Critical Technology Studies (CCTS) of the University of Silesia.

Adam Bała

Ania Malinowska, PhD, PhD, DLitt, Associate Professor
Institute of Culture Studies
Faculty of Humanities
University of Silesia
anna.malinowska@us.edu.pl

IN PURSUIT OF CODE

Let's start at the beginning, i.e. with the myth. The way we think about the future relies on culturally rooted narratives, which are extremely readable, especially in a technological context. Science fiction has been paving the way for our imagination since its inception, which is why it's difficult for us to go beyond the established canon. This also applies to romantic relationships set in the context of the world to come. 'We unconsciously strive for technologies to realise the self-fulfilling prophecies that appear in so-called culture imageries', notes Ania Malinowska. 'Our desire to talk about the future is codified, and we cannot seem to go beyond it. Design foresight is a trend that goes against these tendencies, as it involves a departure from mythical forecasts and attempts to predict all the real scenarios resulting from the behaviour of various technological entities in relation to the ways they are used, as well as the environmental and social conditions in which these devices, platforms, and applications function'.

The second issue is our perception of time – the past lies behind and the future stretches ahead of us. As the researcher emphasises, this human, conventional perception of time is solely a result of our cultural conditioning, and is also inaccurate.

'If we look at the development of devices and practices related to them in the context of romantic relationships, we notice that what seems very modern to us now was in actuality born in the late Middle Ages', says the researcher. 'Even then, love practices were codified, i.e. through the use of idiomatic language and gestures that guided the participants in their interactions: whether it was a romantic, friendly, or an intimate relationship'.

Ania Malinowska refers to text-based games present in the courtly culture of the 13th and 14th centuries, in which individuals would engage in the exchange of specific phrases to help them determine the nature of their future relationship. We use dating apps, text messages, and instant messaging in the same way – to send each other ready-made phrases that help us set the tone for a budding relationship or simply get a sense of its nature. It all comes down to code consumption.

As humans, we are highly semiotic beings, so if we have agreed on a specific code, then our entire emotional apparatus conforms to it', explains the scientist. 'Dating apps provide the perfect environment for this kind of behaviour to be reproduced'.

THE STEPFORD WIVES

When asked about robot wives, which are present in numerous narratives about the future, Ania Malinowska mentions to the book *Love + Sex with Robots*, in which David Levy writes about the human need to create 'better servants'. This stems from our lack of interest in spontaneous relationships – we would prefer to programme them and make them predictable. A robot wife will always be pleasant and affectionate and will never argue with her husband. The scientist also cites a study conducted by Levy, in which participants were asked if they would be interested in a relationship with a robot wife or husband. As it turns out, it is mainly men who seriously consider this scenario – it is men who are most enthusiastic about this option, citing shyness as one of the reasons for their choice. A relationship with a human-like machine circumvents all the psychological barriers that arise when interacting with a real-life partner. It boils down to eliminating the interactive human element. However, as Ania Malinowska notes, there was one fundamental flaw in the methodology of this study. It turned out that none of the participants had ever seen such a robot in real life.

'This means that the statements were based on imagined notions derived from a myth. However, if we were to actually meet such a being, even in its most attractive version, the uncanny valley effect would probably quickly become unbearable. Therefore, most people would rather choose to live with their imaginations of what such a being could be, rather than with an actual robot' says the researcher.

TINDER'S GREAT-GRANDFATHER

Platforms and apps that are supposed to make it easier for us to form romantic relationships actually serve to consume the code, i.e. to experience the emotions associated with the 'high' that such interactions give us. It's about the first stage – from first getting to know each other to deciding to pursue a relationship.

'This is due to our desire to minimise risk', the scientist explains. 'It has accompanied romantic relationships from the very beginning because we always wanted to be sure that the other party's declarations would be fulfilled. Therefore modern technologies use datafication, which aims to patch holes, i.e. eliminate risk.

A new project by Ania Malinowska involves 'love testers' research. Behind this fantastic-sounding name are devices dating back a hundred years – prototypes of today's dating apps.

'They were entertainment machines developed based on the knowledge of psychology available in the 1920s, which used personality traits to identify various compatibilities: first related to military service, then work, and then relationships', explains the researcher.

Love testers were originally rather primitive devices based on a rotary motor and operated by a button or a lever. Inside, the machine was equipped with a set of small boards with personality traits or categories assessing the chances for a romantic relationship. In 1967, Nintendo released an electronic version of such a tester.

'This is where we get to the heart of the matter, namely that magic button. It exposes our need for external adjudication in romantic relationships. We want certainty so badly that we end up not trusting our own judgements. This is something we are conditioned to do from a very young age, so we look for external mediators: matchmakers in the past, and machines today' states Ania Malinowska.

We, therefore, arrive at the conclusion that what the future holds for love is the pursuit of this age-old tradition of minimising risk based on the fast computing power of machines, algorithms, and AI-based systems. Modern love testers will continue to be improved, becoming ever-increasingly accurate and fast. With the help of a wide variety of extensive databases, we will be able to determine with increasing accuracy whether the relationship we have just entered into has a chance of success. Of course, we won't just give up on real-life meetings, rather we will immediately narrow down the range of candidates to only those who could be a perfect match.

'It's heading in the same direction as many other technologies, namely minimising all risks, protecting us from mistakes, eliminating those mistakes, and as a result... completely sterilising relationships', the scientist concludes.

We invest in technologies that will never give us 100% certainty that 'mission love' will be successful, even if we factor in solutions that collect data straight from our bodies, read our micro- and macro-gestures, measure our body temperature, cortisol, dopamine, and serotonin levels, and perform brain scans. Even the most advanced inventions won't be able to tell us if a particular person is 'the one' and if we would be happy together.

LESS HUMAN

Will daily exposure to intelligent machines make us function in perfect human-robot harmony? Not necessarily. Robots, as networked organisms that are not subject to human limitations, are expected to start creating their own cultures. A mycelium or a swarm of bees are very good analogies. Machines can continously learn from their interactions with people and other machines. We tend to assume that they will eventually become more human, but in all likelihood they will process the information they collect in their own way, eventually developing their own system and code of relationships that they consider to be, for example, romantic relationships. But will it be usable and understandable enough for humans?

Ania Malinowska emphasises that she is not a techno-sceptic, but rather a technorealist and even an enthusiast. However, she does not agree with the empowerment of technology.

'We must always have an outsider in our culture. Previously, it was people of a different religion or skin colour, today it is also immigrants who supposedly take our jobs. AI is also taking our jobs! However, contrary to this notion of empowerment, AI does not make social decisions on its own. People do!', states the researcher.

We should look only among ourselves for those guilty of using technology to make relationships less personal. For, as the researcher emphasises, it is us who have compromised the perfect concept of love. We are the ones who use technology to eliminate the human element from romantic relationships. We don't want to take risks; instead, we want everything to be perfect and fast, which is nothing new – we have always strived for quick results.

We also want to protect our ego, which can suffer when our attempts to start a real-life relationship fail. It can be painful to be told no when we have already imagined a whole happy-ever-after scenario. Apps allow us to keep creating these narratives indefinitely – with virtually no risk.

Paweł Porębny, MA

Paweł Porębny, MA
Institute of Law
Faculty of Law and Administration
Doctoral School at the University of Silesia in Katowice
pawel.porebny@us.edu.pl

DEHUMANISATION OF PUBLIC ADMINISTRATION

Humans are constantly striving for progress. Consequently, the technological development of the world is inevitable, and just as in the 19th century there was talk of the industrial revolution, today there is talk of the 4.0 revolution. However, the rapid development of the world brings not only many benefits but also numerous threats, such as an increase in the unemployment rate, lack of data confidentiality, or the loss of human contact as a result of the automation of all services. Does such development not open the door for abuse by the state? Let's take a look at it from the perspective of the individual.

Excessive technological development of a state can lead to a situation where its tools of control cause unjustified interference in every sphere of our private lives. Take China and Singapore, for example, where artificial intelligence is omnipresent and identity verification is done by facial recognition alone. However, the problem is not only digital but also social, as the older generation is gradually being excluded in today's nanotechnological world and young people cannot find jobs due to automation.

The word administration comes from the Latin *ministrare*, which means 'to serve', 'to perform', 'to manage'. The prefix ad- refers to deliberate action. The adjective public (from the Latin publicus) means 'common', 'social'. Do these words adequately describe public administration? Hypothetically, if we were to ask the average citizen, they might have a completely different opinion. There is currently widespread talk of a constitutional crisis in our country, but we should also consider another type of crisis, namely the digital one. What are its defining characteristics? It is part of a broader social crisis that is dehumanising our society, in which the human as a social being (*homo socius*) is no longer in the centre of society but lives on its periphery.

Society has many faces in science. These include mass society, consumer society, and, more recently, civil society. The rapid development of novel technologies in recent times, their low cost and ease of access have contributed to the emergence of a digital society. Nowadays, we can take care of any official matter without even leaving the house. All we need is the right equipment and internet access. Also, the Polish media widely promotes the use of such digital tools as ePUAP, Internet Patient Account (IKP), and the mObywatel mobile application. But do they really make our lives easier?

Let's look at it from the other side, the side of the society as a whole, taking into account the role of the individual in the public sector. There are no receptionists in offices because they have been replaced by tablets. There are also fewer and fewer civil servants, as all formalities can be handled online. The trend described above is already taking place all over the world, which is particularly evident in Asian countries with a high level of technological advancement. In the face of these changes, the human being is becoming an unnecessary social cost.

The problem addressed here is, therefore, multidimensional. On a legal level, constitutional provisions guarantee us equal rights, equal treatment by public authorities, and freedom from discrimination for any reason in political, social, and economic life (see Section 32 of the Polish Constitution). In addition, we are guaranteed many protective mechanisms, the most important of which is the right to a fair trial (see Section 45 of the Polish Constitution). In reality, however, the society is constantly moving forward. Change is its inherent characteristic. Living in the digital age, we have to realise that some professions will disappear due to the increasing digitalisation. The legal profession is no exception.

But what is the crux of the matter? Axiology plays a huge role in law. If the legislator considers the protection of private life (see Section 47 of the Polish Constitution) and data privacy (see Section 51(2) of the Polish Constitution) to be of paramount importance, then these are the supreme constitutional values. What would be the point of violating them?

The problem is that laws are created and applied by people, and humans are flawed by nature. Since information is a valuable currency, the temptation to break these laws is enormous. The law itself is also subject to a value judgement. The value system that we adopt in our European worldview does not necessarily have to be the same in other cultural circles, where different standards may apply. There is, therefore, a risk that in the age of AI, the law will become only a suggestion rather than a binding social fact due to the loss of the human element.

It is certainly tempting to think about what kind of future awaits us. We might wonder what new opportunities or threats will emerge as a result of technological development. The scenarios proposed by masters of the science fiction genre fuel our imaginations.

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