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ACADEMIA

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Authenticity

BARTOSZ NASKRĘCKI
THE ART OF ENCRYPTION

ALEKSANDER WELFE
ON MODELLING
AND DEDICATION

KAMILA
BARANIECKA-OLSZEWSKA
BETWEEN TRUTH
AND AUTHENTICITY

IN THIS ISSUE

COVER IMAGE: LASSE ANDERSSON, INSTAGRAM: FOTOGRAF_LASSE_ANDERSSON.
The photo captures a real dragonfly adorned with dewdrops, appearing as if it were made of crystal.
PHOTOS P. 2: LENSCAP PHOTOGRAPHY/SHUTTERSTOCK.COM, CEZARY PIWOWARSKI, KAMILA BARANIECKA-OLSZEWSKA

Truth or fiction?

The concepts of "authenticity" and "authentic" have been widely and eagerly employed, for some time now, to describe the reality around us. They do not raise any serious doubts when we use them, typically, to assert that an object or work is true, genuine, not a mere copy or falsification. As new trends in philosophy and psychology have emerged, these concepts have increasingly found application in describing human behavior. Within this framework, an authentic person is someone who acts in harmony with their own desires and beliefs. This notion stands in contrast to the earlier ideal of a "respectable" person, someone who complied with set social roles and lived up to others' expectations. While the choice between these attitudes might seem apparent today, it remains uncertain whether the contemporary world is actually moving in that direction. Is it conceivable that, contrary to our official claims, authenticity is at times supplanted by what Erich Fromm termed an "escape from freedom"? In these times of growing uncertainty and polarization, it is worth pondering the prerequisites for authenticity – something universally esteemed and expected from everyone – to prevent it from becoming yet another illusion crafted solely to pacify our souls and feed our egos. An authentic person is someone capable of exercising free will, resisting the pressures of the surrounding world, determining their own priorities, and independently making decisions that mold their reality. Human authenticity, therefore, nurtures the authenticity of the world around them in an evident manner. Is the world we are currently shaping reflective of this? Unfortunately, it is growing increasingly challenging answer this question in the affirmative – suffice it to mention the emergence of information bubbles, the dynamics of social media, the applications of neurobiology, and the use of artificial intelligence in advertising and politics.

Prof. **Marek Figlerowicz**

HTTPS://ARTINHOUSE.PL/

Grażyna Krzemińska, *Alida*, original technique, acrylic, oil, 80×80 cm, 2023

Krzemińska graduated from the Academy of Fine Arts in Gdansk. Stylistically she invokes the paintings of the old masters, while adding contemporary elements. Combining these elements into a whole is meant to yield a metaphorical, poetic story about feelings, loneliness, separation and the pursuit of love, irrespective of place or time.

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Reading History From DNA

Studying ancient human DNA can help us better understand the early histories of states and nations – says **Prof. Marek Figlerowicz** from the PAS Institute of Bioorganic Chemistry in Poznań.

ARTUR DĘBSKI

Analysis of remains from the Mausoleum of the Silesian Piasts in Legnica

What does the field of *archaeogenomics* deal with?

It's a relatively new interdisciplinary field in science that attempts to combine archaeological and historical research with genetic and genomic studies. Swedish evolutionary biologist and geneticist Svante Pääbo, who contributed significantly to the establishment of this new discipline, was awarded the Nobel Prize in 2022.

Back in 2014, when we began the project "Dynasty and Population of the Piast State in View of Integrated Historical, Anthropological and Genomic Research," only a dozen-odd ancient genomes had been sequenced for humans or our close relatives,

Neanderthals or Denisovans. Our project started around the same time as the archaeogenomic revolution unfolded. It arose out of two technological breakthroughs: firstly, the development of modern DNA sequencing methods, which now relatively cheaply and quickly allow us to sequence the entire human genome – the full genetic information present in each of our cells. This includes the so-called nuclear genome, consisting of linear DNA running about 3 billion base pairs long, as well as the mitochondrial genome, with circular DNA about 16,000 base pairs long. Secondly, methods were developed that now allow us to isolate deoxyribonucleic acid from fossil remains.

What can we gain from this new trend in science?
While archaeology and history are disciplines in which we try to learn something about humans by studying the products of their civilization, archaeogenomics allows us to learn about the biological history of individuals and populations by analyzing information encoded in DNA. As it turns out, this can tell us quite a lot. Not only about our origins, who our ancestors were, but also about certain unexpected issues, such as social relations, including the lack of equality between women and men or different groups of people, and the impact of these relations on the genetic structure of populations. Archaeogenomics is, therefore, a new research direction in which genomic analysis is used to strive to better understand and comprehend human history.

What's so remarkable about this? Such research provides hard evidence of how things really were, rather than being based on mere speculation or assumptions about how things might have been. I am convinced that the history we learn in school is largely a kind of "imagined reality," a very simplified and embellished vision of the past, often far from the truth. Of course, archaeogenomic research will not answer all our questions, but it does allow us to verify certain theories about where we came from, who our ancestors were, and what they looked like. Moreover, archaeogenomics can tell us a lot about the social relations that prevailed among particular populations or groups, to what extent they were based on inequality, whether they had a patriarchal or matriarchal system, etc.

But how is it possible to draw conclusions about social inequality, by looking at samples under a microscope?
In his book *Inequality: A Genetic History*, the Spanish biologist Carles Lalueza-Fox gives many examples of how this can be done. One of them concerns the colonization of America. It turns out that a small group of newcomers from Spain so dominated some regions of Mexico that there are virtually no native male lineages there today. They have been almost entirely replaced by European lineages. This shows the degree of the European dominance: it indicates that children fathered by locals had no chance of survival, or that there were no such children at all. Women were treated as machines for producing offspring for the invaders. The variation in the genomes clearly show this. Women contribute the X chromosome to the genome, and men X or Y. Thus, significantly less variation in the Y chromosome than in the X chromosome indicates that the very same men were constantly having children with many different women.

Similar conclusions are also drawn from other studies. As a result, it seems to be a valid view that women are the source of greater genetic variability than men. We have observed a similar phenomenon in our studies of populations that inhabited areas of contemporary Poland 1,000 and 2,000 years ago. We found that in the entire first millennium CE, practically the same female lineages were maintained in this area. This means that the women were always local, and if incomers appeared, they were men.

> Archaeogenomic research will not answer all our questions, but it does allow us to verify theories about where we came from, who our ancestors were, and what they looked like.

How does collaboration between scientists working in such different disciplines work in practice?
The team of our Institute itself is highly interdisciplinary; we work in chemistry, biology, and computer science. Therefore, when talking within the institute, we often use different languages. Perhaps as a result we have developed certain methods of communicating with people who apply different research approaches or represent a different way of thinking. Besides, I personally have an interest in philosophy, which is a kind of reflection of our history and combines the sciences and humanities. Philosophy tries to form a coherent picture of the reality we experience; it epitomizes interdisciplinarity and is the key to understanding the world around us.

It is therefore a great pity that philosophy is almost absent from our daily lives. If we could convince people to take a slightly broader view of our world, they would surely see that it does not belong to us alone, that other people, animals, and plants all inhabit this world, that there are different ways of arriving at the truth. This would undoubtedly make the world

a much better place. No one would believe that their laws and arguments are supreme. Unfortunately, for a long time, one of the features of European philosophy was the assumption that there is a single objective truth. We tried to capture it by positing dogmas, which unfortunately usually have the flaw of being unverifiable. Science grew to become another way of striving for the truth.

> It is not good that the humanities have been developing for many years in a certain isolation from the biological history of humankind.

How is your research likely to change our school textbooks?

For many years, we have been studying human, animal, plant, and viral genomes in our laboratories only in order to solve very specific biological problems. The findings were usually published in specialized international journals, which are in practical terms inaccessible to the general public. I wanted to change this state of affairs and to do research that would have a direct bearing on people's lives. Around the same time, I realized the great potential of combining genomics with history and archaeology. It can contribute to a better understanding and comprehension of the past, especially in situations where our ideas about what happened are based on very tenuous premises. This is the case, for instance, for the processes leading to the formation of the first state in the region of present-day Poland, ruled by the Piast dynasty. There are no written documents about those historical events. The supposedly well-known facts about the alleged progenitor of the Piast dynasty, Kołodziej – about scattered settlements among great forests – are in fact unsupported notions that have been propagated for years.

Additionally, for 200 years there has been debate over the origin of the Slavs in the territories of contemporary Poland. The beginnings of that debate coincide with the times in which Poland was under foreign partition, which further intensified it. The first, "allochthonous" hypothesis stipulates that 2,000 years ago these lands were inhabited by German tribes, but they emigrated away during the Migration Period, resulting in a so-called settlement void. Then around the 6th century CE, the Slavs arrived from the east to fill it. The second hypothesis posits that Slavs have lived here for several thousand years. Our hope is that studying genomes will finally allow us to resolve this mystery.

Anthropological analysis of ancient remains

MAŁGORZATA MARCINKOWSKA-SWOJAK

So are you looking for authentic Slavic DNA?

Our findings indicate that the concept of "Slavs" is more of a cultural category. We think that this group was formed by populations of different genetic origins. We have shown that people who lived in the territory of contemporary Poland both 2,000 and 1,000 years ago were genetically similar to their contemporaries in northern Europe, living in the territories of present-day North Germany, Denmark, Sweden. So it can be said that we had much more in common with the west and north of today's Europe than with the populations inhabiting the territories of present-day Russia or Ukraine. Poland's inhabitants were as distant from the Sarmatians living in the east as from the Spaniards in the west. So where did the idea come from, that we Poles have a common genetic background with Croats or Serbs? If we look at our appearance, our phenotype, we can plainly see that we are different. It seems that the culture with which we identify prompted us create common roots.

Our work has shown that all the genetic elements needed to form the society of the Piast state were present in the territory of present-day Poland around the 4th century CE. These observations coincide with the recent findings of linguists. They believe that the individual Slavic languages, including Polish, Russian, Czech, began to form in Central and Eastern Europe at about the same time, around the 4th century CE. This means that people who had previously led a more nomadic lifestyle began to produce local cultures that became somewhat more stable and began to take on their own character.

How should we view the history of our entire species?

It is not good that the humanities have been developing for many years in a certain isolation from the biological history of humankind. *Homo sapiens* arose roughly 300,000 years ago. We then lived as hunter-gatherers for about 290,000 years. That is, all of known human civilization based on agriculture and urban centers came in just the last 10,000 years. Unfortunately, in our considerations about the human condition we often rely solely on this last period, ignoring the first 290,000 years of our development. Fortunately, we can now read the information that is written in our genes concerning our distant past. Only once we manage to combine this information with the observations of archaeologists and historians will we have a real chance to get to know humans as thinking beings.

In the course of evolution, nature constantly creates and verifies new traits. At some point, humanity was endowed with intelligence, which is such a new feature that is now being tested out. I have serious doubts about whether we will manage to pass this test. Every species has a beginning and an end. A particular trait may offer a temporary advantage, but it must disappear if in the long run it does not benefit the whole Earth. We often think that our civilization is extremely old and everything we have created within it has already been thoroughly tested out. We forget that individual biological species develop over hundreds of thousands, millions of years. The 10,000 years of the existence of our civilization is just a blink of the eye, a time of blindly testing out various far-from-optimal solutions. This is best evidenced by the fact that everything we have created so far has been based on inequality, injustice, exploiting other people. We have not yet matured to use our intelligence on a mass scale in a creative and positive way.

MAŁGORZATA MARCINKOWSKA-SWOJAK

A lab for studying ancient DNA (aDNA)

INTERVIEWED BY
JUSTYNA ORLOWSKA, PHD

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Forgeries in Paleontology

Paleontological research faces a persistent challenge: distinguishing genuine fossils from skillful forgeries – a task crucial for maintaining the scientific rigor and historical credibility of the discipline.

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Grzegorz Pacyna, PhD is a paleobotanist. His current research focuses on the taxonomy and evolutionary significance of coniferous plants from the Upper Triassic of Poland, as well as the taxonomy, evolution, paleoecology, and succession of flora from the Jurassic of the Holy Cross Mountains. He also works on plant–animal interactions in the fossil record and biostratigraphy using fossil plants.
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Prof. Tomasz Sulej is a paleontologist specializing in Triassic amphibians and reptiles from Silesia, the Kraków-Częstochowa Upland, and the Holy Cross Mountains, being particularly interested in their lifestyle and evolution. He leads the Young Paleontologist Club at the Museum of Evolution of the PAS Institute of Paleobiology.
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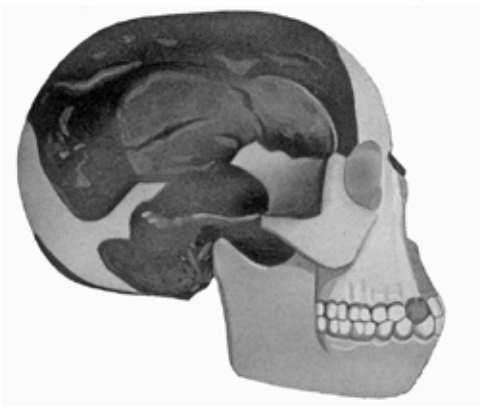
Paleontology is a natural science in which the theme of "authenticity" is especially pertinent. The concept resonates at various levels, including both the object of study – the fossils themselves – as well as to the scientists studying them. Paleontologists often experience a particular sense of straddling across a divide, working as they do at the intersection of biology and geology, as well as at the confluence of experimental and historical science. Unfortunately, this rift can sometimes give rise to irregularities that run counter to the ideals of authenticity. Fossils, which are not infrequently precious, one-of-a-kind objects that represent potentially groundbreaking discoveries for understanding the history of life on Earth, are objects of great desire for both scholars and collectors, as they can bring significant fame and sometimes fortune to their discoverers. This opens up the temptation for certain unethical practices, including attempts to "adjust" nature so that fossils will better dovetail with prevailing and fashionable theories and hypotheses.



J. ARTHUR THOMSON, *THE OUTLINE OF SCIENCE*, 1922, PUBLIC DOMAIN, VIA WIKIMEDIA COMMONS

Reconstruction of the "human" skull of the Piltdown man – parts derived from different skulls are shown in different shades of gray

The fossil record

The allure of fossils certainly extends far beyond scientific interest, attracting collectors and traders alike. All too often, the potential for significant financial gain tempts unscrupulous individuals to fabricate forgeries. At fossil markets, amidst all the genuine and intriguing specimens on offer, one can sometimes also find well-crafted fakes. While these forgeries typically mislead only amateurs, even seasoned scientists have occasionally been taken in.

Interestingly, the forging of fossils has been going on almost as long as there has been scientific interest in them. A infamous example is the case of eighteenth-century German Professor Johann Beringer, who "discovered" fabricated fossils at the sites he was studying. In fact, scientists in conflict with Beringer had purposefully planted them there in order to discredit him. Not realizing the hoax, he wrote an exten-

One of the present authors, Tomasz Sulej, at a meeting with local residents of Miedary, held at an excavation site

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is a palynologist. She studies spores and pollen grains of Mesozoic plants, mainly from the Jurassic. Based on palynological analysis of rocks, she tracks climatic and environmental change in the areas under study. She describes and identifies spores and pollen grains in situ, which is important for determining the botanical relationships of fossil plants.
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sive treatise on these now-famous "Lying Stones." When the truth emerged, he unsuccessfully tried to buy up the entire print-run of his newly published work. The case ended up in court, and the creators of the forged fossils faced unpleasant consequences for their actions – something that is unfortunately nowadays rare in cases of fossil forgery. Today, Beringer's book is an antiquarian rarity, and the forged fossils described in it (including carved representations of plants and animals, as well as depictions of the sun, stars, comets, and Hebrew letters) now figure in the collections of several museums. Deceptions of this crude kind were possible back in those times, because paleontological knowledge and understanding of the nature of fossils were at a fairly early stage of development.

One of the most spectacular recent cases is the story of a chimera that made the cover of the prestigious *National Geographic* magazine in 1999. A Chinese fossil-collector had glued the tail of a *Microraptor* dromaeosaur to the skeleton of a bird from the genus *Yanornis*, masking the differences in the rocks containing these fragments so well that the buyers did not notice (both fragments came from the same rock formation). The authors of the article even ventured to name the new alleged genus *Archaeorap-*

MBQ, CC BY-SA 4.0, VIA WIKIMEDIA COMMONS

Some of the fake fossil specimens "found" by Beringer, now on display at the Senckenberg Naturmuseum in Frankfurt

The early bird species *Yanornis martini*

The four-winged dinosaur *Microraptor zhaoianus*

Reconstruction of the chimera ("patchwork" specimen) of the alleged species *Archaeoraptor liaoningensis*

ENTELOGNATHUS, CC BY-SA 4.0, VIA WIKIMEDIA COMMONS

tor. Fortunately, in this story, all the scientists who had examined this "specimen" had blocked it from being published in prestigious journals. The main blame in this case – apart from the perpetrator of the hoax – therefore lies with the editors and authors at *National Geographic*.

Forgeries for fame

There have also been forgeries and mistakes resulting from excessive ambition, overconfidence, and even ill-will on the part of scholars, negatively impacting the overall picture of fossil research. The Piltdown man case was one that had an exceptionally detrimental effect on the course of research into our species' origins. This incident, meticulously analyzed in numerous studies, demonstrates how ambition, a desire to gain fame and to fit in with the prevailing scientific views of the time, as well as prejudice and racist beliefs, all led to one of the greatest forgeries in paleontology. Found in an English gravel pit at the beginning of the 20th century, the Piltdown skull was purported to belong to the "oldest Englishman." It also seemed to confirm the then-prevailing views that human's large brain had evolved first, followed by the visceral cranium, and that modern man arose in Europe, not Africa. It took forty years to finally arrive at the truth: that nothing like this genuinely existed in nature, that the specimen was a hodge-podge made of parts of a human cranium, an orangutan jaw, and chimpanzee teeth. But during those decades, the Piltdown man greatly muddied the waters of research into human origins and slowed down progress in the field.

Another fascinating story touching upon authenticity is that of the Indian paleontologist Vishwa Jit Gupta, who authored many publications about fossils, mainly from the Himalayas, in journals including *Science* and *Nature*. He took photos of fossils from paleontologists he met at conferences, then slightly modified them (such as by mirroring them), and submitted them as images of his own alleged specimens from India. Reviewers, of course, were unable to determine whether his specimens were actually from the Himalayas. Interestingly, even after the exposure of his numerous forgeries and after facing an internal enquiry at his university, he was still retained there on staff as a lecturer.

The forged fossil of the alleged specimen *Archaeoraptor liaoningensis*

JONATHAN CHEN, CC BY-SA 4.0, VIA WIKIMEDIA COMMONS

Doctored specimens

There have also been erroneous reconstructions of authentic fossils that "improved upon" nature, unfortunately affecting the understanding of phylogeny and having a long-lasting impact on the course of research on a particular group. The well-known Indian paleobotanist Birbal Sahni "corrected" a specimen of the

Permian conifer *Buriadia*, which he had described, for exhibition purposes – to such an extent that it exhibited features (such as seeds formed not in cones, but directly on shoots between normal leaves) unknown in any other conifers. Since it did not contradict the general views of the evolution of early gymnosperms, his interpretation held up for quite a long time, but was nevertheless quite problematic for other paleobotanists studying early conifers. It was not until the original specimen was re-examined in the early twenty-first century that the truth became clear. The juxtaposition of seeds situated adjacently to branches was in fact the product of a "creative" fossil reconstruction, and *Buriadia* turned out to be a coniferous plant rather similar to others from the Permian – rather than one turning the conifer phylogeny upside-down.

Fake or real?

Sometimes authentic fossils have been mistaken for fakes – most often by people from outside the scientific community. During public science-themed events, we ourselves have frequently encountered individuals who firmly insist that the authentic fossils we showed to them were in fact fabrications. Similar skepticism is sometimes exhibited by indigenous communities living near excavation sites – even showing the locals clearly identifiable, partially exposed bones often fails to convince them that these are not simply the remains of cows or horses buried by local residents years ago.

As these examples serve to show, authenticity is a crucial attribute in scientific research, both for the objects studied and the researchers themselves. It significantly influences the quality and credibility of scientific work – especially in paleontology, where a single fossil can serve as the foundation for important theories about the evolution of species and the history of life on Earth. The falsification of fossils stands as a prime example of how authenticity can be compromised in scientific research, adversely impacting the public's perception of evolutionary theory. ■

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JOHN COOKE, PUBLIC DOMAIN, VIA WIKIMEDIA COMMONS

Fig. 1
Reproduction of a painting showing a team of scientists examining the skull of the Piltdown man – one of them is the scientist considered to be the initiator of the hoax

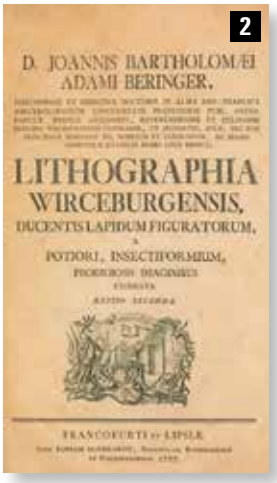

Fig. 2, 3, 4
The cover of Beringer's treatise and two illustrations from it showing examples of the now-famous "Lying Stones"

THE BIODIVERSITY HERITAGE LIBRARY, CONTRIBUTED BY SMITHSONIAN LIBRARIES. BIODIVERSITYLIBRARY.ORG

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SENOHRABEK/SHUTTERSTOCK.COM

Syntactic Borrowings

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Polish has been influenced by other languages in a variety of ways – bringing in not only new words but also syntactic borrowings. Syntactic calques from English, increasingly common in recent years, often lead to unnatural-sounding or unnecessarily complex sentence structures in Polish.

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Many a word has been written about the influence of foreign languages on Polish (nowadays especially English) in academic papers, press articles, letters to the editor from upset readers or debates on online fora. The vast majority of these musings are concerned with lexical borrowings. Virtually every Polish speaker can name at least a few Anglicisms, e.g., *biznes*, *quad*, *leasing* or *Internet*. Some will also name some calques, including *mysz komputerowa* "computer mouse" in IT, *mapa drogowa* "roadmap" in political parlance, or the use of *definiować* in the meaning "determine sth" (as in *To zdefiniowało moją drogę zawodową* "That defined my career path"). Much less attention is given to grammatical borrowings, which may involve inflexion or syntax.

Syntactic borrowing can be defined as the reproduction of certain syntactic patterns from a donor language in a recipient language. A frequently cited example is the construction **brać się za coś* "set about doing something," which is a syntactic borrowing from Russian that competes with the indigenous construction *brać się do czegoś*. Linguists have repeatedly cited various types of syntactic borrowings from English, including the following:

- Nominal modifiers: *biznes informacje, kredyt bank* – head nouns are modified by other nouns in the nominative form, as in English, rather than in the indigenous Polish structure modified by a post-nominal adjective (*informacje biznesowe* "business information," *bank kredytowy* "credit bank").
- Prenominal classifying adjectives: *obcy język*, *egzamin ustny* – the borrowed pattern involves placing the adjective before the head noun, as in English ("foreign language," "oral exam") whereas in Polish a classifying adjective should properly follow the noun (*język obcy*, *egzamin ustny*).

- Imperative forms in advertising language, such as *Weź udział w konkursie i wygraj 200 złotych!* "Take part in the competition and win 200 zloty!". Such slogans would be more natural in Polish if rephrased as conditional statements (*Jeśli… możesz…* "If you… you could….").

These three types certainly do not encompass all English syntactic borrowings in contemporary Polish. For example, something a bit odd is happening to phrases like *po raz drugi* "for the second time," *nie po raz pierwszy* "not for the first time." Instead of these, one is increasingly hearing a more complex pattern beginning with *to* "it": *to drugi/nie pierwszy raz, gdy…* most evidently a calque of the English "it's the second/not the first time that…"

Syntactic switch-ups

Yet another example is afforded by the use of the verbs *wykorzystać/użyć* "to use" to introduce a tool. Instead of the simpler construction native to Polish, with the tool in the instrumental case – *Otworzyli drzwi nożem* "They opened the door with a knife" – one is often hearing sentences like *Użyli noża, by otworzyć drzwi* "They used a knife to open the door" (a verbatim copying of the English structure). The use of the articles in English merits some attention here: there is an indefinite article preceding *knife* and a definite one before *door*. Thus, the sentence refers to a specific door that has been already mentioned in the text (all the example sentences cited herein are of course taken from longer texts, which we can sometimes partially reconstruct in our minds), and to a knife that is a new element on the scene. Unlike English, Polish has no articles at all, but word order provides clues as to what is old and what is new. A general rule in Polish holds that new information is best placed towards the end of a clause, whereas known, or given, information is best found sentence-initially. This is the case with *Otworzyli drzwi nożem*, where the knife is introduced last, while the more complex borrowed pattern with *użyć* has *nóż* introduced mid-sentence and *drzwi* appearing last, as if to say that the knife was a given and opening a door was new information. The borrowed structure, therefore, may be informationally confusing.

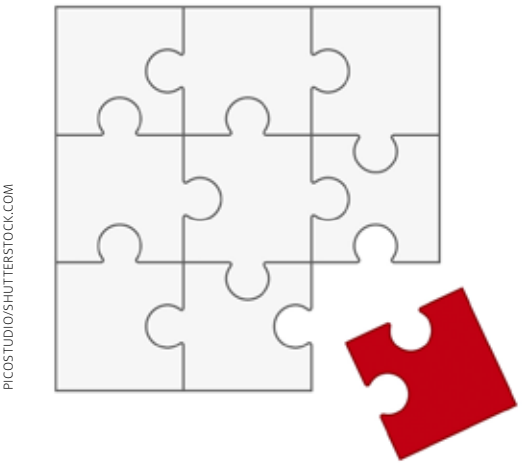
This last example is a good illustration of a more general trend: syntactic borrowings from English often alter the natural word order of Polish sentences. Word order plays a key grammatical role in English, determining whether a given clause is a question or a declarative clause and also the function of particular words in sentences: subject and object nouns, adjectives or even verbs may all look the same, and English speakers keep track of what's what based on the word order (usually subject-verb-object). Word order in Polish, by contrast, plays quite a different role: it is relatively free, as grammatical endings clearly identify parts of speech as well as such clause functions as subject or object. More examples of borrowed syntactic patterns are listed below, all of them taken from Polish radio broadcasts or newspaper articles in the last decade.

Polish sentences introducing an event traditionally begin with phrases identifying the time and place of the event, followed by a description of what happened, as in *Wczoraj pod Warszawą rozbił się helikopter* (literally: "Yesterday over Warsaw crashed a helicopter"). Headlines found in the press and on the news-tickers featured on TV often apply the unnatural order subject-verb-adverbials (time/space), identical to their presumed English counterparts: *Helikopter rozbił się pod Warszawą* (literally: "A helicopter crashed over Warsaw"). Similar examples may be found in the main body of press articles: *Kilka incydentów miało miejsce od tego czasu* "Several incidents have occurred since that time," *Trzy rzeczy wydarzyły się w tym roku, o których naprawdę warto mówić* "Three things happened this year that are truly worth talking about."

> Instead of phrases like *po raz drugi* "for the second time," Polish speakers are increasingly using a more complex pattern with *to*, evidently a calque of the English "it's the second time that…"

In each of these real-world examples, the Polish syntax follows closely that of the English equivalents. But in each case – just as in the sentence about a helicopter – the subject introduces new information. In Polish, as we have seen above, a sentence most naturally begins with known information, whereas new information is provided towards the end. One way given information is identified is with the demonstrative adjectives *ten/ta/to* (*this/that*). Thus, the phrase *od tego czasu* "since that time" certainly refers to a particular time mentioned earlier. The consequence is that such sentences would be much better if reformulated to align with the given-new pattern: *Od tego czasu miało miejsce kilka incydentów, W tym roku wydarzyły się …* The impact of such English-influenced word order is it decreases the flexibility and natural expressiveness of Polish syntax.

The relative inflexibility of English word order means that different means have to be used in English to highlight certain sentence constituents. In English, new information can be brought to the fore using the *It's X (who)…* construction, as in *It was Daniel I met yesterday*. The corresponding Polish sentence pattern is



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To X (czegoś dokonał), and the example sentence could be rendered as *To Daniela wczoraj spotkałem*. Note that the English pattern is more complex, requiring a subordinate clause, while the Polish equivalent just puts the highlighted element after *to* at the beginning of the clause. Given information in a sentence, in turn, can be highlighted in English using the construction *What… is that….*, which can be quite literally rendered in Polish as *To, co…, to…* Because new and given information can be easily signaled using word order in Polish, these two constructions (known as "cleft constructions") are much more rarely needed in natural-sounding Polish. Nevertheless, under the influence of English, both of them are trending patterns in recent Polish usage.

Real-life examples include: *To, co jest niepokojące w naszym przekonaniu, to zaobserwowaliśmy…* "What is disturbing in our conviction is that we have observed…" *To, co uniemożliwia dalsze prace, to brak możliwości identyfikacji* "What is preventing further work is the inability to identify…" *To, czego chcieli, to stworzenie miejsca dla kibiców MU, które sami chcieliby odwiedzić* "What they wanted was to create a place for MU fans that they themselves would like to visit". Sentences of this sort can often easily be reformulated to be simpler, more natural-sounding, and much more in sync with the natural functions of Polish word order: *Niepokojące w naszym przekonaniu jest to/fakt, że zaobserwowaliśmy… Dalsze prace uniemożliwia brak możliwości identyfikacji. Chcieli stworzyć miejsce dla kibiców MU, które sami….*

It was a nice day when…

Another area where English syntax is leaving its mark on Polish is the increasing use of time clauses instead of adverbial phrases. For instance: *Był ładny wiosenny dzień, kiedy James Bond wybrał się na wycieczkę za Londyn* "It was a nice spring day when James Bond made an excursion out of London." Instead of mirroring the English syntax, which puts the time in a separate clause in order to make it come first, Polish can simply use an adverbial phrase first: *Pewnego ładnego dnia wiosną James Bond…* "One fine day in the spring James Bond…" Much like the cleft constructions mentioned above, the syntactic structure in question here is not entirely alien to Polish – it has long been in use. Rather, the influence of English makes itself felt in the increasing frequency of this type of clause in sentence-initial position, leading to a decreasing use of prepositional time adverbials.

Another change in recent Polish is that sentences using adjectives to describe the speaker's emotional response to some news or event are increasingly including *to* "it/that" as a semantically empty subject. For example: *Było to dla mnie szokujące dowiedzieć się, że był w siedzibie UB, gdy doszło tam do krwawej zbrodni* "It was shocking for me to learn that he was at the secret-police headquarters when a bloody crime occurred there," *To było bardzo przygnębiające tak obserwować, jak przewodniczący Rady…* It was very depressing to watch how the Chairman of the Council…," *To może zająć kilka dni, zanim uda się dotrzeć do wszystkich ofiar katastrofy.* "It may take a few days before all the victims of the disaster can be reached." The more traditional pattern for expressing this kind of content in Polish does not use *to* and the word order is slightly different: *Przygnębiające było obserwować.…* Sometimes more extensive changes are necessary, as in *Dotarcie do wszystkich… może zająć kilka dni*.

The various kinds of syntactic borrowing presented above are often plainly the result of "automatic" word-for-word translating of media texts from English. However, they are also occurring more and more in language produced spontaneously by Polish native speakers. Should they then be considered distortions of correct Polish? On the one hand, unlike lexical borrowings like *leasing*, the recreated sentence patterns are usually not something completely new in Polish grammar; speakers may sometimes opt to use them. Familiarity with the English sentence schemata merely facilitates their activation when speakers are forming utterances in Polish. However, while the constructions themselves do not sound unnatural in Polish, their growing popularity is certainly to the detriment of more traditional patterns which generally involve subtly manipulating word order within the confines of the simple clause.

Such changes are therefore not beneficial – but do they have an impact on the "authenticity" of Polish? To some extent, yes, because they reduce the significance of word order, which is a powerful tool for expressing communicative nuances in inflectional languages. On the other hand – just like the lexicon – the syntactic system of Polish also consists of both native elements and ones that were once borrowed, but which are no longer sensed as being foreign. Perhaps the innovations described in this article will end up becoming assimilated in this way. ■

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To Be or Not to Be (Yourself)

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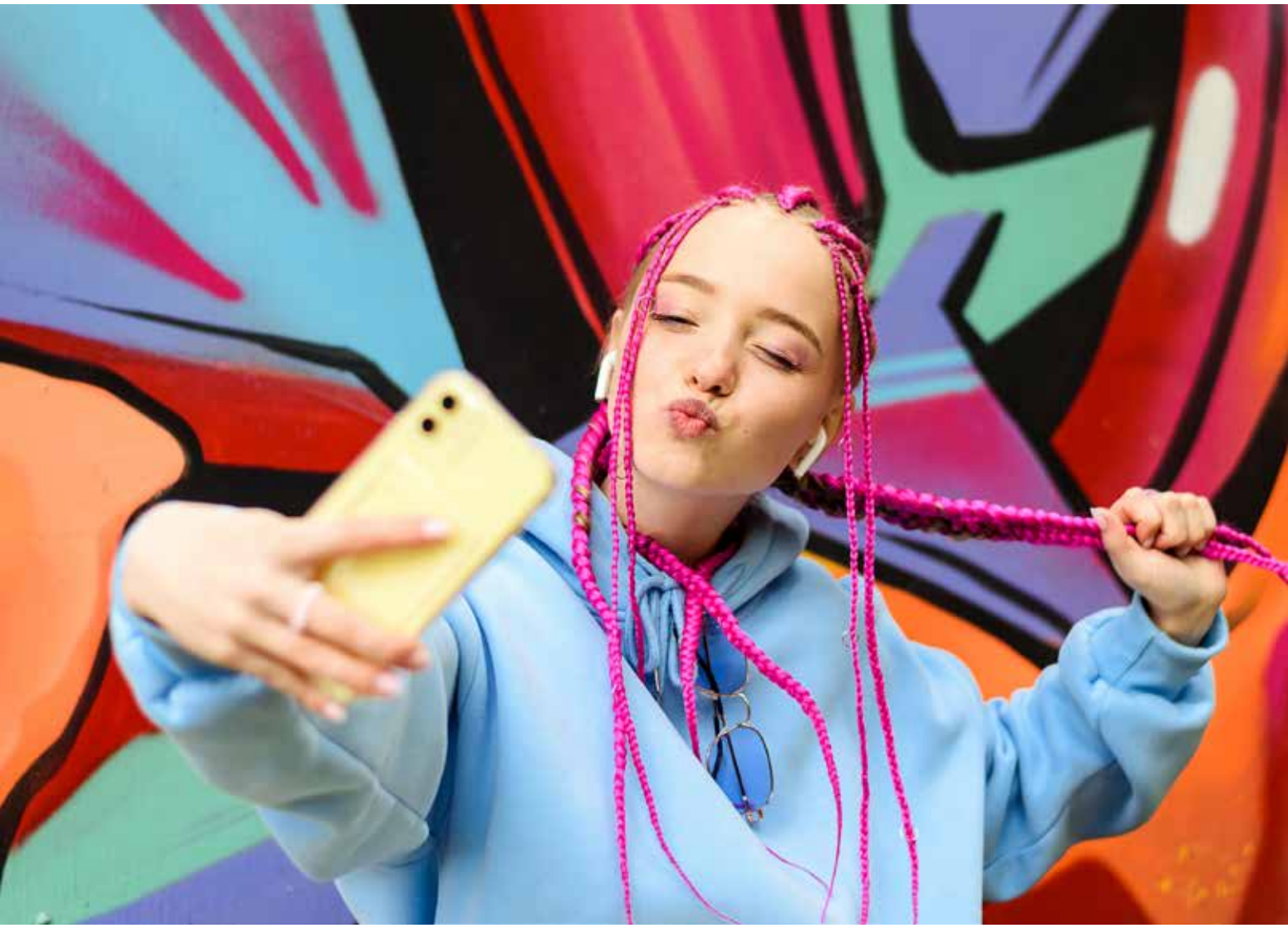
In our social-media era, the boundary between what we portray as true and what is false is growing increasingly thin. The decision of how we present ourselves on social media has a significant impact on our mental well-being.



TATIANA BUZMAKOVA/SHUTTERSTOCK.COM

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Right after waking up, Sophie heads to the bathroom to put on her makeup, then gets back in bed to snap a selfie. She posts it on Instagram, suggesting in the caption that the photo shows her natural look (#iwokeuplikethis). James, out a morning walk, buys himself a green smoothie, which he promptly throws away after merely tasting it. But before doing so, he shares a photo of it on his profile, with an appropriate hashtag (#healthybreakfast). These are scenes from a popular YouTube video entitled "Are you living an Insta lie?", but it is safe to say they are a good reflection of common behaviors among young people today. The film has sparked a lively discussion about authenticity in the modern world. Are we truly living an "Insta lie"? And if so, what does it give us, and what does it take away?

> One of the most important reasons why young people turn to Facebook or Instagram is the opportunity for extensive, virtually limitless self-presentation.

Psychologists consider *authenticity*, or being oneself, to be one of the fundamental preconditions for the process of self-development and attaining satisfaction in life. According to Carl Rogers, one of the founders of person-centered psychology, an authentic person is one who neither pretends nor hides their true personality. They express their needs, feelings, and beliefs in a sincere manner. This is a beautiful, profound vision of a person who understands and accepts themselves – their psychological and physical characteristics – and who is engaged in a constant process of self-discovery.

The self

Rogers believed that our "self" combines two dimensions. The "ideal self" is the person you want to become, while the "real self" is who you actually are. To achieve a sense of fulfillment, we need to bring these two selves closer together – to make them more *congruent*. This is no easy task, as our "self" is shaped by many factors: by our personal experiences, especially those from childhood and adolescence, as well as by the values and expectations of the culture to which we belong. Therefore, we live in a constant discord between who we really are and who we would like to be – including in the context of social expectations.

Nowadays – something Rogers probably did not foresee – social media play a significant role in shaping the "self," especially among young people, and in setting the standards and norms of the given culture. The video mentioned above provides us with several clues about the contemporary notion of the "ideal self." It implies that we should present ourselves as physically attractive, dress fashionably, visit posh restaurants, buy only healthy food, actively engage in sports (setting new records), enjoy a vibrant social life, and have successful relationships. As my research shows, it is also thought to be very important to boast about this "ideal self" to others.

For teenagers, for whom peer acceptance is an important element of their identity, it is especially difficult to resist the temptation of presenting their everyday life in an idealized way. Each time young people go onto Instagram or TikTok, they make a decision (more consciously or less so) about whether to present their real "self" or succumb to the pressure to project an ideal reality using filters and retouching. However, the choices they make entail specific consequences.

Idealization

Projecting an ideal reality certainly has some plus sides. Self-idealization can help us recognize the disconnect between our "real self" and "ideal self." The desire to reduce this gap can, in turn, contribute to self-improvement. For instance, James, the character from the video, might continue buying different healthy dishes until he eventually finds ones he likes, and so ultimately decide to adopt a healthy lifestyle. He would then be presenting a more accurate image of himself on Instagram. However, such outcomes are rare.

The problem, it seems, is that Instagram was not really designed for showing one's "real self." At its core lies promoting materialistic desires, which are characteristic of the dominant consumer culture in Western countries. More and more people are nowadays believing that the key to happiness is achieving financial success, prestige, and an attractive outward image. However, research clearly shows that such an attitude towards life is – paradoxically – associated with lower life satisfaction and a lower sense of fulfillment. This is the case for at least two reasons. First, when we focus on materialistic goals, we pay less attention to what truly brings happiness, such as

self-development or building deep, meaningful relationships with others. Second, achieving materialistic desires is actually impossible in a fundamental way – there will always be people richer or more attractive than us. Especially in the world of social media, which is essentially the primary source of social standards for young people today.

The problem with Instagram is that the scale of self-idealization there is significantly greater than in real life. An entire industry has sprung up around people's desire to present an ideal version of themselves. A constant supply of new filters allows users to modify everything from their skin tone to the size of their eyes or face. On Instagram, people have become virtual curators of themselves, editing or staging content pertaining to their appearance, personality, or interests. Much like the renowned Canadian-American sociologist Erving Goffman described in his theory of social interaction, Instagram users put on virtual masks and become actors, wanting to present themselves in the very best light. At the same time, they are spectators, absorbing what others consider attractive and desirable.

Vicious cycle

In the long term, inauthenticity in social media can be psychologically costly. The negative effects of the "Insta lie" make themselves particularly evident in studies on self-esteem among young people. Research shows that greater use of social media is associated with lower self-esteem. On the one hand, this may suggest that platforms like Instagram tend to attract people with low self-esteem, or on the other hand, it may indicate that participating in the spectacle of extreme idealization on these apps can lead to a deterioration of one's self-worth. In other words, it is hard to pin down the direction of the relationship between self-esteem and self-idealization in social media. It most likely operates as a vicious cycle: the lower our self-esteem, the more inclined we are to present an idealized version of ourselves on social media to feel better for a moment, thanks to the likes and hearts we receive from other users. However, the more often we present an idealized version of ourselves online, the worse we feel about ourselves. Acting contrary to our "real self" leads to internal conflict, and a wide disconnect between our "real self" and "ideal self" leads to psychological discomfort. In the world of social media, this is primarily associated with a lack of acceptance for anything outside the norm, as well as the impossibility of actually achieving the ideal imposed by society. Moreover, self-idealization perpetuates the existing standards in social media, which affects other users. This contributes to a general decline in self-esteem and can lead to various mental health problems, such as depression or anxiety disorders.

Truth

Importantly, although expressing our "true self" in social media may put us at risk of criticism and rejection, in the long term, doing so allows us to build more lasting and genuine relationships with other users. A study conducted by the American psychologist Erica Bailey and her team in 2020 confirms that being authentic in social media – expressing oneself in accordance with one's own personality – is associated with greater life satisfaction.

As a society, we certainly have our work cut out for us in coping with the "Insta lie." It would be good if the creators of social media themselves took more responsibility for the consequences of their actions. In 2021, journalists from the *Wall Street Journal* revealed secret data from Meta (the owner of Facebook and Instagram), showing that the creators of Instagram were well aware of the drastic consequences this app was having on teenagers' self-esteem. It is worth knowing that the content shown by social media is not always consistent with what teenagers want to see (or should see). What appears in the newsfeeds of young people is largely decided by the algorithms of the tech giants – who design new services that promote materialism and unrealistic standards. It may perhaps be difficult to speak of any kind of "truth" in social media, as they are primarily profit-focused and serve the corporate goals of their owners.

> As parents, teachers, researchers, and activists, we all need to point out aware of how social media should be used to avoid the trap of the "ideal self."

However, companies like Meta are not the only ones responsible for the social changes in this area. As parents, teachers, researchers, and activists, we all need to be drawing attention to how social media should be properly used, to avoid falling into the trap of the "ideal self" imposed by pop culture. We need to talk about what values lead to a good life, and point out the consequences of living in a consumer culture. Young people need to be able to develop their "real self" as well as an "ideal self" based on their own needs and personal potential. Then perhaps they will create – or force corporations to create – media apps that, in opposition to the "Insta lie," will enable the building of a "social media truth." ■

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The Art of Encryption

In our digitally driven era, safeguarding information has become paramount. Encrypting data is essential for keeping it safe and secure.

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The twenty-first century is the era of information. We live our lives immersed in an unending stream of data, unparalleled in any previous era in history. To transmit all this data effectively and securely, we make constant use of highly sophisticated encryption methods. The fundamental ideas of such encryption in fact date back to ancient times.

To illustrate the basic concept of encryption, let's say we want to send a message to someone in another room: a short sentence like "I am in the next room." This information is intended for one person only. Anyone who speaks English, however, will easily understand the sentence and draw the obvious conclusions. We need a way to encode the text, but in a way that makes it easy to undo, i.e., decode the original message. We can encrypt the message using a simple method.

Let's start with a string of capital letters IAMINTHENEXTROOM (removing spaces does not pose a significant challenge to reading). We replace the letter A with B, B with C, etc., moving through all 26 letters, with letter Z changing back to A. As a result, we

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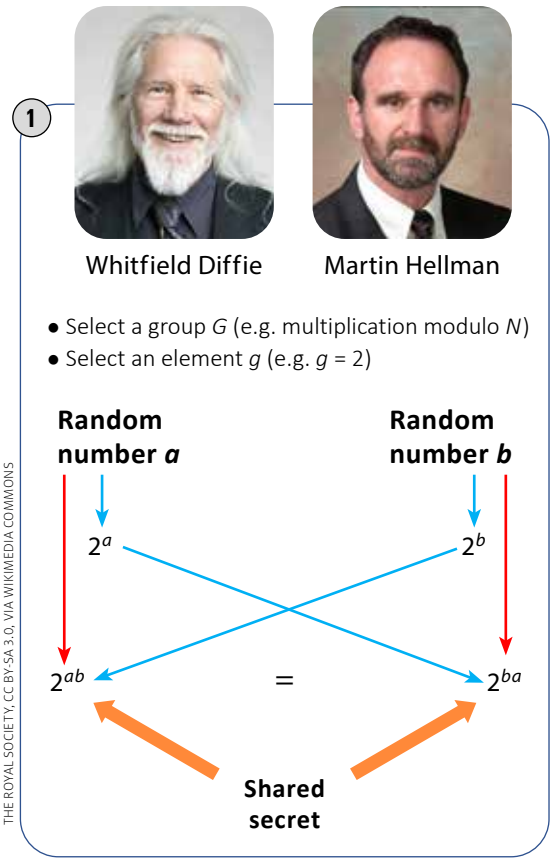
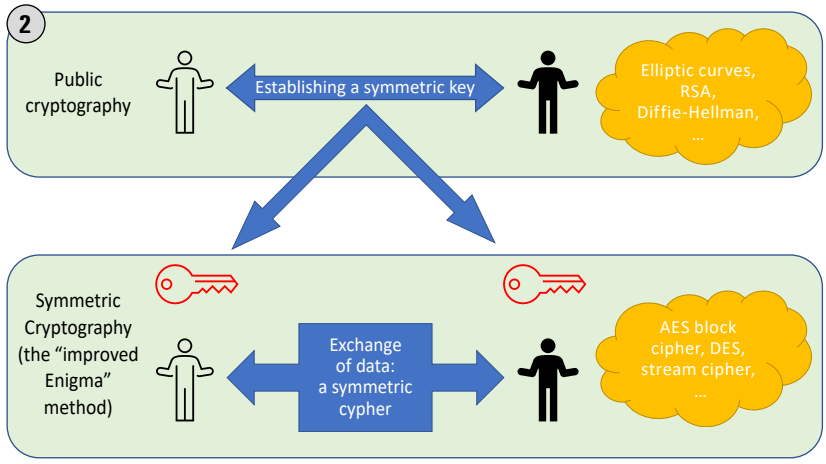


Diffie-Hellman Exchange

Two individuals agree on a number, for instance, 2. Each of them then arbitrarily selects a secret integer, say a and b. They calculate 2^a and 2^b and send each other the result. They now compute $(2^a)^b$ and $(2^b)^a$ – in both cases, the result is equal to $2^{(a*b)}$ – and this becomes their shared secret. If the exponentiation operation is performed in modular arithmetic (that is, stated as a remainder after division by N), we get a result for which the task of reconstructing the original exponents a and b is extremely complex. The problem of recovering a number a from (2^a modulo N) is known as the *discrete logarithm problem*. Generating shared secrets in this way is incredibly simple and effective. It is a solution to the problem of creating a common key for block cipher exchange (Fig. 2).



get the text: JBNJOUIFOFYUSPPN. It doesn't look very intelligible, right? If we openly exchange a scrap of paper with this text written on it, even visibly to strangers in the room, no one will be able to easily read the message. How can the recipient decode the message? Simply by shifting the letters one position back in the alphabet, to arrive at the message: IAMINTHENEXTROOM.

This method of encoding information is known as a *Caesar cipher*. The Roman statesman Julius Caesar used this simple technique to conceal information from prying eyes. The most important features of this method include quick encoding of the message, reversibility of the process, keeping the message concealed from outsiders, and a small amount of information needed for encoding/decoding.

These four features in fact remain the fundamental postulates of today's information security. The essence of modern cryptography – the science of creating and breaking ciphers – is to develop procedures that meet these very same requirements and guarantee us a high level of security: in other words, guaranteeing that it is virtually impossible to read the original message without knowing a secret key.

When surfing the Internet today, we no longer exchange scraps of paper with symbols written on them, but the above principles of data transmission still very much apply. Today's data-processing procedures nevertheless have to cope with sending a huge number of messages: an amount of information that can roughly be represented by a set of symbols reaching 10^{20} elements. A basic Caesar cipher is too simple to safely encode such a hard-to-imagine quantity of data.

Fig. 1
Diffie-Hellman Exchange

Fig. 2
The method of encryption commonly used for webpages

The Middle Ages

An idea devised by Blaise de Vigenère, a French scholar from the sixteenth century, comes to our rescue here. The Caesar cipher, which involves shifting letters by a fixed number of positions, is very easy to break. For each language (English or Polish, say), we can draw up a table of letter frequencies in normal text. If we compare this to a text in the encoded alphabet, aligning the most frequently occurring letters will often enable us to easily guess by how many positions the text needs to be shifted to decode the message. Vigenère's clever idea was that we can set a codeword key of unknown length, the individual letters of which will then determine by how many positions we shift each successive character in the message to be encoded.

For example, let's say we agree on the key "ABC." Translating these letters into the number of shifts, we get:

A => 0; B => 1; C => 2.

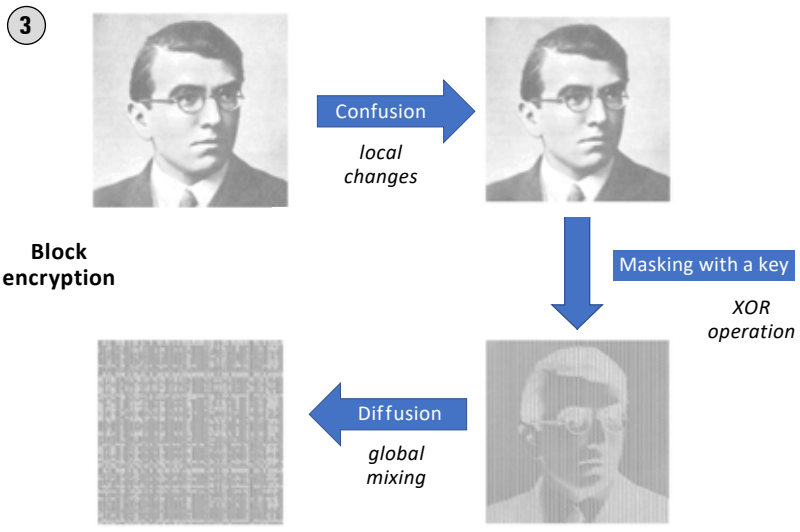


Fig. 3
Block encryption – the example photo is of Henryk Zygalski, one of the three Poznan cryptologists who broke the Enigma system

Let's say the message is: THEQUICKBROWNFOX. They key is reiterated to match the length of the message, so we use ABCABCABCABCABCA (which means: shift the first letter by zero positions, the next letter by one, the next by two, then repeat). The resulting encoded message is: TIGQVKCLDRPYNGQX.

By using a long enough codeword, we can make it very difficult to break such a cipher. When the length of the key is equal to the length of the message, so that each letter is shifted a different number of positions, we get a perfect cipher, called a *one-time pad*.

Breaking such codes is so difficult that in practice it is impossible without special methods. A complex device using a complex version of Vigenère's cipher, called the Enigma, was developed by the German military for use in World War II. An intricate system, encrypting virtually every letter with a different alphabet, made it nearly impenetrable. However, this code was first cracked in 1932 by Marian Rejewski, a graduate of the University of Poznań. Also instrumental to this breakthrough were Jerzy Różycki and Henryk Zygalski, Rejewski's colleagues at the Polish Cipher Bureau. They identified and exploited certain regularities in the Enigma's encryption patterns.

Block ciphers

The era of the World Wars and post-war years saw the gradual transformation of encryption from the classical domain of linguistics into what we now call modern cryptography. A great leap forward came in the 1970s, when traditional character-based encryption was replaced by more sophisticated *block ciphers*.

Using a block cipher can be likened to shuffling a deck of cards. In each round, we perform operations that are seemingly trivial: confusion, masking with a key, diffusion (Fig. 3). Repeated many times, they give rise to tremendous complexity in the cipher. The Data Encryption Standard, invented in 1975, and its successor, the Advanced Encryption Standard from 2001, are currently the primary ciphers used for securely encoding very large messages. Practically all internet traffic is encrypted with the AES standard.

Interestingly, this cipher fundamentally relies on a single, computationally simple operation: calculating the inverse of an element in a finite field (specifically, a 256-element field). This gives us an improved Caesar cipher, ideal for encrypting a movie or other large datasets.

For ciphers to be used successfully, both the sender and receiver of the message must know the encryption key. In the mid-1970s, two solutions to this problem emerged in cryptography. The first idea involves generating a shared secret using the so-called Diffie-Hellman protocol. The second involves creating a procedure with two keys (Fig. 4): a public one, used only for encrypting messages, and a private one, used only for decoding them. We still need a procedure that will generate such a pair of keys and allow us to

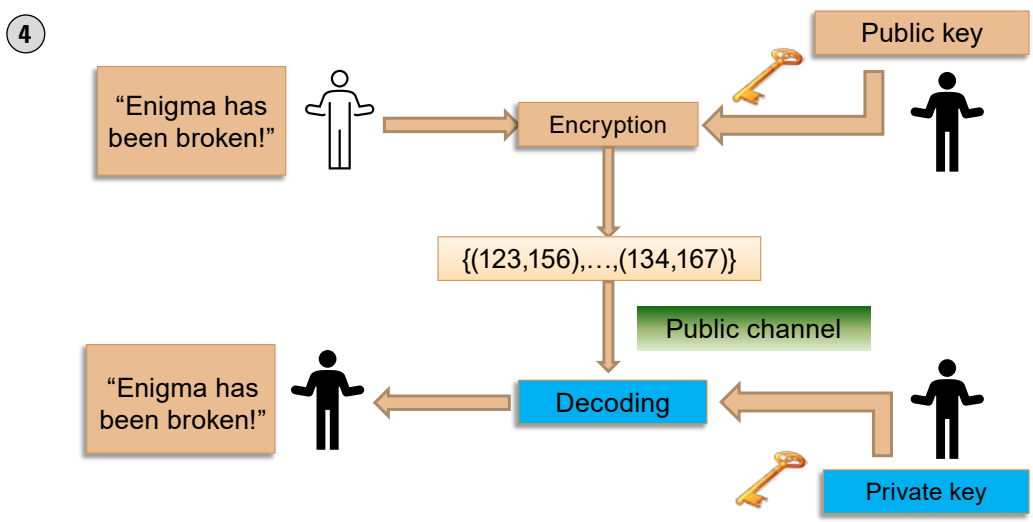


Fig. 4
Cryptography with a public key

publicly share only the key marked as "public." This way, anyone can send us a secret, but no unauthorized person can read it without the private key. This idea was implemented in a concrete way by Ron Rivest, Adi Shamir and Leonard Adleman – their now widespread method is known as the *RSA algorithm*.

Forward into the future

Since the 1990s, the field of cryptography has increasingly become the domain of mathematicians specializing in numerical and algebraic theories. A notable advancement in recent years has been the transition from traditional exponentiation (raising a number to a power) to a more complex algebraic process known as *elliptic curve addition*. Elliptic curves are objects developed in the field of algebra and geometry, which have proved enormously useful in such diverse fields of science as high-energy physics, differential geometry, analysis, and number theory. The famous proof of the Fermat's Last Theorem put forward by Andrew Wiles in 1994 uses elliptic curves at crucial parts of the argument. Cryptographers were relatively slow to discover these mathematical objects, but when they did it was with great effect. Every aspect of our "online life" now uses elliptic curves to ensure a high level of security against password breaking.

In the 1980s, a certain threat to the security of the RSA algorithm and the Diffie-Hellman protocol emerged in the form of Peter Shor's factorization algorithm. Given a large quantum computer, this algorithm would easily break codes based on multiplication.

The increasingly robust development of quantum computing and quantum information theory has touched off another great leap forward by cryptographers dealing with RSA, elliptic curves, and factorization. Recent years have witnessed the birth of a completely new field, known as *post-quantum cryptography*. Currently, several encryption algorithms are competing to become the frontrunner, poised to replace all the existing protocols, which large quantum computers are expected to easily break in the future. The field is evolving rapidly and with high stakes. Among the dozens of candidates that were to the Post-Quantum Cryptography contest, announced in 2016 by the American National Institute of Standards and Technology, most have already been broken. The race continues among the winners of the fourth round of the contest, announced in 2022: CRYSTALS-Kyber (for generating a common secret), CRYSTALS-Dilithium, FALCON, and SPHINCS+ (algorithms for obtaining an electronic signature).

Another alternative is *quantum cryptography*: an extremely rapidly developing field of physics and quantum computing theory, working to construct laser-based systems for long-distance transmission of information that is highly secure (on the level of physical laws). The basic idea here involves generating a shared secret by utilizing the enigmatic phenomenon of quantum entanglement of particles. Polish scientists have significantly contributed to advancing this technology. Professor Artur Ekert, a theoretical physicist, was recently with the Milner Award for his contributions to the field.

Contemporary civilization is based on information and requires strong certifications of data transmission security. The security postulates are so demanding that to meet them, the complex and incredibly advanced mathematical apparatus of algebra, number theory, combinatorics, and statistics is marshalled into service. Therefore, it can be confidently said that mathematics has appeared practically everywhere thanks to the global Internet. It acts as a mysterious, "quiet and well-oiled" mechanism that, in a hidden way like in Umberto Eco's *Foucault's Pendulum*, governs our world and allows us to sleep peacefully as computational machines work hard to ensure our safety and prosperity. ■

RSA encryption

starts with selecting two very large prime numbers. We calculate their product, $N = pq$. Finding the values of p and q from the number N is an extremely difficult task (Fig. 5). A message sent using the RSA algorithm is a number, say m. Using the numbers p and q, we prepare a private and public key. We randomly choose a number e, which is coprime with $(p-1)(q-1)$. We calculate the number d, which has the property that $ed = 1$ modulo $(p-1)(q-1)$. We have obtained the private key (N, d) and the public key (N, e). A message can be safely transmitted by performing modular exponentiation: $c = m^e$ modulo N. A third party without knowledge of the numbers p and q cannot recreate the message m. To decode the message, use: $m = c^d$ modulo N.

5


Ron
RIVEST


Adi
SHAMIR


Leonard
ADLEMAN

- We choose a large integer N. We establish two integers e and d, which provide reversible modulus operations ("wrapping around the clockface").
- RSA Encryption: we encode the message m as $c = m^e$.
- RSA Decoding: we decode the ciphertext c using c^d.
- Calculations are performed *modulo N* ("wrapping around the clockface").

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The Plague of Authenticity

On the notion of authenticity and whether it is worth pursuing.

Mikołaj Sławkowski-Rode

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Our modern understanding of the concept of authenticity emerged as a result of cultural and social changes that took place back in the seventeenth and eighteenth centuries. The widespread popularity of portraits and biographies during that period was a consequence of the emergence of a new ideal of the individual and a different way of perceiving the individual's place in society. Society itself began to be seen merely as a result of social contract and slowly lost its organic unity, while the value of the individual was no longer determined by their social role, achievements, or knowledge, but by their individual character.

These changes led to a deepening disconnect between the public persona and the private self. The tension between these aspects of a person's identity was universally seen in a negative light, as a deceitful duplicity. *Authenticity*, which is often perceived as the opposite of this duplicity, came to be seen as not only positive but also as highly desirable – in stark contrast to hypocrisy and conventionality. In reality, however, the opposite is the case: the contemporary cult of authenticity actually promotes hypocrisy and conventionality.

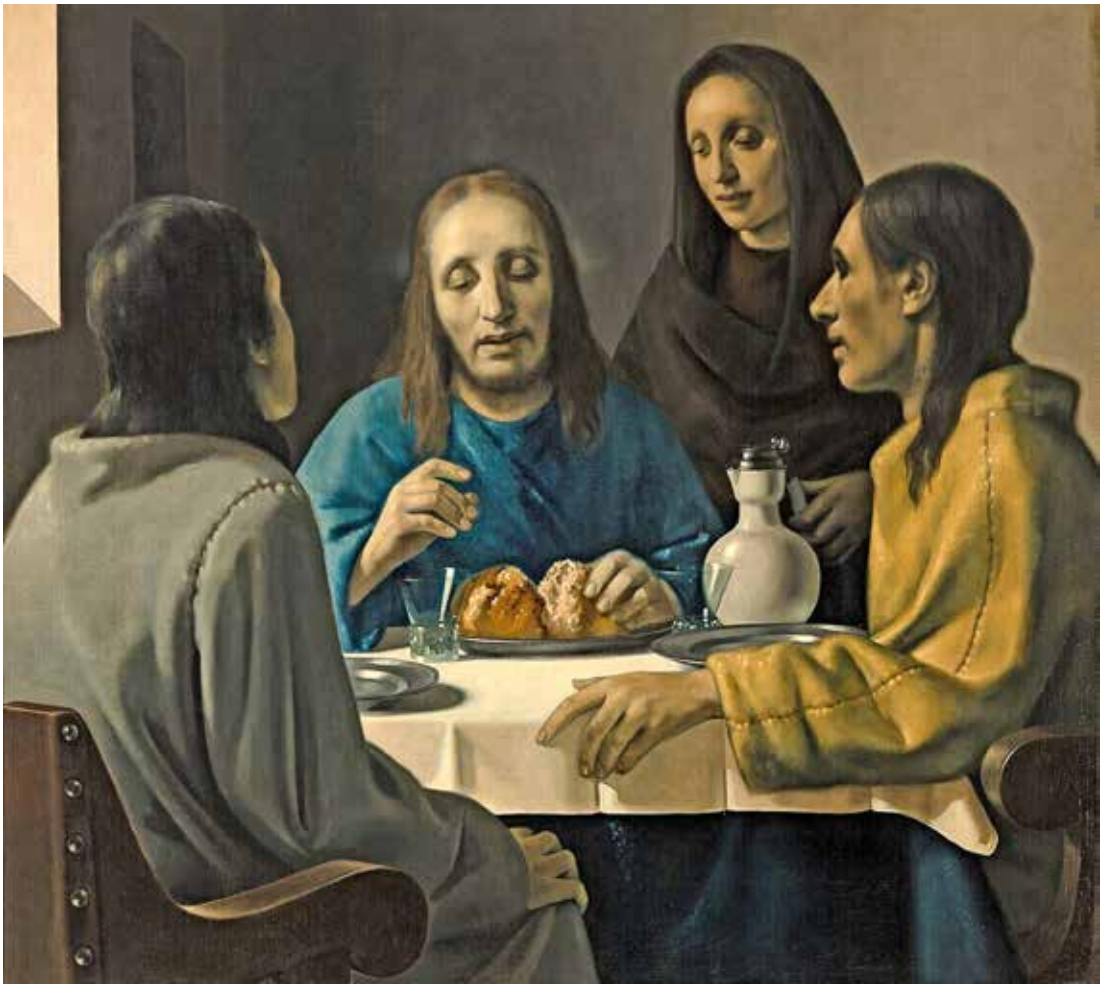
Shades of Authenticity

Starting in the seventeenth century, the concept of authenticity colonized Western culture and it has gradually acquired many closely related senses. We can talk about authentic gestures, for instance, and when we call a person authentic, we mean that their actions and statements express their character, rather than conceal it.

Objects can also be authentic. If we say "this is an authentic Biedermeier," we mean not only that this particular sofa resembles a dachshund, but that it was actually made between the end of the Napoleonic wars and the revolutions of 1848. Money is authentic only if it was produced in an official mint, so even a perfect counterfeit will still be false currency in light of its origins.

One significant kind of object which we expect to exhibit authenticity is an artwork – and here we often find a combination of the aforementioned meanings of the concept. We expect, for instance, works of art to actually be the creation of a specific artist (like money being produced in a mint). But of course not only that. Authenticity in this sense is naturally connected with the period of creation, as well as to the materials and techniques used. Moreover, we expect a work of art to express some inner state of the artist: to be authentic in the sense of revealing the individual character of its creator. Art, on this understanding, is a gesture that conveys or synthesizes some experience, as beheld in the "eyes of the artist's soul." Its authenticity is thus related to the authenticity of the experiences it can give us, as the audience.

The "death of the author," as proclaimed by the French philosopher Roland Barthes (in other words, the liberation of the reception of a work of art from the artist's intentions), does not undermine this aspect of the authenticity of art. On the contrary, it actually intensifies it, shifting the expectation of authenticity onto ourselves as recipients: in the wake of the "death of the author," what our aesthetic experience reveals is our own individuality and sensitivity, rather than the character of the artist or the quality of his or her experience as expressed in the work. The great artist therefore is replaced by the "great interpreter," who satisfies the need for



HAN VAN MEEGEREN, PUBLIC DOMAIN, VIA WIKIMEDIA COMMONS

Henricus Antonius van Meegeren, *Supper at Emmaus*

their own authenticity through the conspicuous consumption of artistic objects.

The example of art shows that authenticity is closely linked with originality: authenticity is a valuable quality to the extent that it testifies to originality – ideally, uniqueness. When the artist's originality ceases to be a point of reference, what remains is our own originality. This, in turn, requires us to find original means of expression, which, as mere passive recipients, we do not possess. The pursuit of the recipient's own originality thus precipitates a rapid inflation of the means to express it: too many people admire Jackson Pollock, for instance, for us to be able to stand out as a result of taking an interest in his work. This forces the "great interpreter" to constantly chase new experiences that will allow them to be "true to themselves."

Inauthenticity

This interdependency of authenticity and originality points us towards the source of the modern-day bankruptcy of both concepts. This source becomes evident once we consider what the lack of authenticity means in art, and how it is usually judged. Broadly, we can distinguish three types of artistic inauthenticity: copying, forgery, and plagiarism. Copies as a form of art have largely gone out of fashion and have been replaced by mechanical reproductions. A copy is inauthentic in a relatively unproblematic way as it does not deceive us – it does not pretend to be the original. We may decide to have a copy because we know the original is unattainable for us.

Forgery is different. It is inauthenticity *par excellence* – it is an attempt to deceive, presenting a copy as if it were the original. This phenomenon, once prevalent in the art world, can nowadays often be seen in caricature in the form of chintzy tote-bags bearing the logos of famous high-end brands as well as prolific knockoffs of pop mass-culture tropes.

However, forgery can also consist in imitating someone's style, mimicking a recognized master. Posing as a well-known artist is an interesting case of inauthenticity, as it is not immediately obvious in what sense the audience is being deceived. We are, of course, deceived with regard to the authorship, but what exactly is the forger imitating? After all, he or she

is not literally pretending to be the author they imitate – they don't dress up to come off in their likeness, etc. To understand forgery it is instructive to consider the example of Han van Meegeren, a modern-day Dutch forger who gained fame by imitating Vermeer. He managed to fool the greatest authorities on Dutch Golden Age painting, and his works, especially "The Supper at Emmaus," still stir controversy.

One could say that what is being imitated here is technique (mastery of the means of expression made available by a given medium) and style (the original use of these means). However, in a trivial sense, technique cannot be imitated, just as one cannot imitate riding a bike without actually doing it. In an important sense, the same is true of style. A perfect imitation of someone else's style is as paradoxical an idea as a perfect imitation of someone else's cycling style – it simply cannot be achieved without actually adopting that style, as it were, genuinely.

However, one could say that technique and style are in an important sense merely vehicles here, and that what van Meegeren had imitated was Vermeer's sensitivity – his own individual way of perceiving and representing human experience. Yet even in this case, it seems that imitation is impossible without a profound understanding of the imitated author's sensitivity, and the ability to "step into" that sensitivity to such an extent so as to be able to convincingly apply it to a subject matter never attended to by the original artist. Even after van Meegeren had confessed to his forgery, the supposed recognition of Vermeer's sensitivity made some experts defend the authenticity of his canvases in court.

> The contemporary cult of authenticity actually promotes hypocrisy and conventionality. Nothing is more derivative and doomed to commodification than the pursuit of self-expression.

Van Meegeren does not imitate either the style or sensitivity of Vermeer with the intent that they be attributed to him, on the contrary: his forgery consists in presenting Vermeer as a different artist than the one we know. The deception lies in the fact that it misrepresents what Vermeer tells us. Despite the deception, the convincing achievement of this goal remains impressive. It demonstrates an authentic mastery of the original artist's skills and authentic assimilation of his sensitivity. This is attested to not only by the enormous popularity van Meegeren gained after his trial, but also by the continued posthumous interest in exhibitions of his forged canvases.

Apart from forgery, however, there is also plagiarism, which is a form of inauthenticity most humiliating to those found guilty of it. Plagiarism is the appropriation of someone else's achievements. While an impressive forgery can even bring the forger fame, plagiarism is inevitably associated with disgrace. This is because plagiarism is evidence not only of insincerity but also – and more importantly – of a deeper dearth of creative potential.

Original gestures are unrepeatable: they become clichés with the very first repetition. The problem is that every gesture is original in the straightforward sense: it has simply never happened before and will not repeat. Very rarely, however, does a gesture reveal to us the depth of human experience and emotion as, for example, the gesture captured by Vermeer in "Woman in Blue Reading a Letter."

Global Authenticity

It is precisely the fear of being stigmatized as lacking originality that has created most of the cultural junk heap that is called contemporary art. It is no coincidence that the Spring of Nations was also the spring of kitsch. Nothing is more derivative and doomed to commodification than the pursuit of self-expression – invariably fueled by merchandising campaigns of international corporations. Global capitalism, however, is not the root cause, but the result of individualism. In the first half of the 20th century, it became the expectation for a great artist not only to create great works but also to bring forth a new, unique style that defined a new trend in art history – and which immediately become part of history and not a live option for other artists to pursue.

These one-time trends were all still-births, because even the slightest attempt at borrowing from them or even referencing would go against the ubiquitous demand for uniqueness, and therefore authenticity. And so – in a sense paradoxically, but in another sense as an obvious consequence – in the latter half of the twentieth century it was precisely artistic "quotations" or conscious clichés that became the last resort in the pursuit of authenticity. When creating anew inevitably ceased to be anything original, only an ironic and self-conscious quotation remained as a possible expression of one's originality.

But is this not the world we live in? Have not the structures of local communities and customs, as well as the religious practices uniting them into one culture, succumbed to an irreversible erosion? Are not the conventions that ensured the very possibility of dialogue within culture, and thus its evolution, now a thing of the past? If so, then perhaps the experiences

JOHANNES VERMEER, PUBLIC DOMAIN, VIA WIKIMEDIA COMMONS

Johannes Vermeer, *Woman in Blue Reading a Letter*

of individuals no longer have anything fundamentally in common, and – consequently – there can be no returning to the idea of a "style of the time" and so, perhaps, the only authentic means of expression now available to us are various forms of pastiche?

It seems to me that things are not so far gone. The ideal of authenticity is not something that has become unattainable due to our social, political, and historical circumstances. Rather, it is a contemporary fiction that has never been a within reach. A little known but vivid example of this is Johann Jakob Froberger, a fifteenth-century German composer, born two years before the outbreak of the Thirty Years' War. His life was marked by hunger, brutality, and death, including the death of his wife and daughter, who contracted the plague. Yet despite all this, Froberger's works do not bear the mark of his individual suffering. Froberger had the courage not to fixate on himself, but to instead attend to what he believed to transcend individual experience and so to be of universal, not merely individual importance.

Froberger is now almost forgotten. Authenticity gives the illusion of the kind of fame that Herostratus attained. But there was only one Herostratus, and his selfish act leaves no room for epigones, let alone tradition. It is a more self-conscious and ultimately more courageous attitude to run the risk of obscurity, which is inherently bound up with belonging to a tradition and working within a convention. Few have heard of Froberger, because it is hard to call him authentic, but without him, we would not have Bach, Händel, or Pachelbel. ■

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Genetically Copying Poland's Oldest Oaks

Typically, a plant's genotype can be replicated through vegetative propagation. Oak trees, however, cannot be reproduced by this method. So how can we preserve the ancient genotypes of monumental oaks, many of which are dying?

Paweł Chmielarz

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The ancient oak trees (*Quercus robur* L.) growing in Poland are up to about 800 years old. Unfortunately, their lives eventually reach their ends – for natural, or increasingly for human-caused reasons. For instance, the Napoleon oak, which until recently grew in the Lubusz region and had a circumference of 1052 cm (measured at a height of 1.3 m), died in 2010 as a result of arson. Our team noticed firsthand the rapid pace at which ancient oaks are now dying when we collected material during a five-year research project concerning the possibility of cloning monumental oaks using the micropropagation method. We discovered that several of these centuries-old trees died within the short period of the project or shortly thereafter. For example, the monumental Chrobry oak from the Szprotawa Forest District, which was estimated to be about 800 years old and from which we collected material in 2013, fell victim to arson the following year. It survived for another six years before finally succumbing in 2020. Another tree, the approximately 400-year-old Bolesław oak in the village of Bagicz in the Ustronie Morskie commune, was felled by a storm in 2016. The Mieszko I oak, the oldest oak tree in the Mazowieckie Voivodeship, estimated at nearly 600 years old, was set on fire in June 2019. Among the three oldest oaks in the Rogalin Landscape Park (which has the largest cluster of centuries-old pedunculate oaks in Europe, with a total of about 1400 trees), one, the Czech oak, is now dead, while another, the Lech oak, is experiencing the disintegration of its main trunk.

Old oaks are certainly more vulnerable than younger trees to acts of vandalism. However, there are also other reasons why these ancient trees are dying. These include climate change, deteriorating water conditions, the presence of insect pests, pathogenic fungi, and improperly performed conservation work. Moreover, because old trees have a huge, sprawling crown, a cracked and hollow trunk, and at the same time a very small root mass compared to the aboveground part, they are increasingly susceptible to toppling over.

Copying genotypes

The monumental pedunculate oaks growing in Poland possess many valuable traits involving resistance to changing environmental factors, which have been shaped over hundreds of years. Furthermore, for local communities, these ancient trees are more than just an important element of the landscape. This means there is a desire to protect these trees, or at least their genes, which gives rise to the question of whether it is possible, using vegetative methods, to cultivate a seedling that possesses a genetically exact copy of the genotype

KRZYSZTOF BORKOWSKI

The 800-year-old oak Rus, one of the oldest in the Rogalin National Park – which is home to Europe's largest cluster of such trees

of the mother tree. At the same time, preserving the genotypes of monumental oaks through cloning is a potential way of preserving biological diversity.

Vegetative reproduction is a technique in which a new plant is grown from a fragment or cutting of an old one. It can be used with many species of horticultural plants, as well as forest trees, poplars, or willows, and ensures the preservation of all the traits (genotype) of the mother plant. However, it is not possible in the case of oaks. Unfortunately, the non-woody shoots of these plants do not form roots. Neither are they formed by woody stem cuttings, layerings, or live stakes taken from oaks. In addition, the process of rooting oak shoots is particularly ineffective in the aged trees we studied. The method of grafting an oak sapling can be used, but it does not ensure that a complete copy of the mother tree's genome is obtained, since in grafting the rootstock comes from another plant of the same species. Therefore, obtaining a copy of the entire oak genome appeared to require *in vitro* micropropagation techniques. In our research, we sought to answer the question of whether it is possible to initiate *in vitro* cultures of shoots from approximately 800-year-old oaks, to maintain them by multiplying the shoots in sterile jars, and then to root them also in *in vitro* cultures.

Micropropagation in glass

The method of growing plant tissue in sterile *in vitro* cultures utilizes a phenomenon called *totipotency* – the predisposition of even a single plant cell to

regenerate into a new, complete organism with stem and root. The starting material taken from the mother plant for such cultivation – known as an *explant* – can be a fragment of seed containing the growth meristem or a piece of leaf or shoot with a bud. To guide cell growth in a desired way, appropriate stimuli need to be supplied in the form of growth regulators, cytokinins or auxins, as well as macro- and microelements, vitamins, and sugar, which under normal conditions is produced entirely during photosynthesis.

In successive stages of *in vitro* cultivation, such guidance seeks to trigger leafy shoots to produce roots. They are placed in a medium containing growth regulators in appropriate concentrations, in the presence of activated carbon, with light exposure, and at room temperature. The final, difficult stage involves the acclimatization of seedlings from *in vitro* cultures to *ex vitro* conditions.

The process of acclimatization to *ex vitro* conditions should be gradual, as the shoot and root experience a shock from the sudden shift out of their previous environment. The leaves must learn to close and open their stomata, the roots to properly develop in solid substrate. The stomata of plants grown *in vitro* are unable to close, and so during acclimatization to *ex vitro* conditions, excessive transpiration occurs through the constantly open stomata of the delicate structure of leaves that developed back in the sterile jar. Furthermore, these leaves have been observed to have a different shape in plants grown in tissue cultures compared to those grown in greenhouses: generally, plants from *in vitro* cultures have thinner leaves, a poorly developed palisade mesophyll layer, large air spaces in the mesophyll, and fewer conducting bundles. Moreover, *in vitro* cultivation disturbs the synthesis of protective substances (such as wax), whose intense production only begins during the acclimatization process. Another important aspect of the acclimatization process involves changing the feeding strategy from mixotrophic (sugar is taken from the agar medium and also produced during photosynthesis) to autotrophic, when sugar comes entirely from photosynthesis.

All this means that during acclimatization, the plant must quickly develop new leaves, or the leaves formed *in vitro* culture must quickly restructure their mesophyll tissue before they dry out due to an insufficient wax layer of the epidermal cell cuticle. The roots, too, change environment from soft agar to the hard reality of the potting soil. An effective acclimatization process must be gradual over a sufficiently long period of time, allowing the micro-seedlings to adapt to natural atmospheric conditions and undo the changes caused by *in vitro* cultivation. This is an extremely difficult period in the life of the plants, but if it is divided into stages during which the humidity is decreased gradually, if the substrate and containers are properly selected, and if the physiological condition of the plants is good, then about 80–90 percent of them survive.

Oaks in *in vitro* cultures

PAWEŁ CHMIELARZ

Preserving the oldest oaks

In our study, we used woody shoots of pedunculate oaks – obtained from 21 of the most impressive and oldest oaks growing in Poland, having the status of monumental trees – as material for initiating at first vase cultures, and then *in vitro* cultures. The breast-height girth of the mother trees ranged from 470 to 1036 cm, and their approximate age, determined by dendrochronological studies, ranged between about 300–800 years (the ages of most of the monumental trees studied are estimated roughly in 50-year increments). The woody shoots were placed in vase culture at high humidity and a temperature of 20°C. Over four weeks, sprouts of some 2–20 cm grew from the epicormic (dormant) buds under the cork the woody shoots (the first stage of tissue rejuvenation). Small fragments of these shoots, about 2 cm long, containing 1–2 buds, were then used to initiate *in vitro* cultures. Initiating sterile *in vitro* cultures before placing explants on sterile agar medium requires that microorganisms (spores of fungi, bacteria) found on the surface or inside the explants must be eliminated. In our study, an appropriately concentrated solution of mercury chloride was used, followed by four rinses in sterile water. The sprouts were grown under *in vitro* conditions – facilitated using Woody Plant Medium (WPM), a mixture of chemical compounds containing essential macro- and microelements needed for plant growth – with cyclic transfers to fresh medium of the same composition (the second stage of rejuvenation). The medium was also supplemented with vitamins, amino acids, sugar (as an energy source), and growth regulators, mainly 6-benzylaminopurine (BAP). Appropriately developing shoots were induced to grow on a medium

supplemented with growth hormones, mainly auxin and cytokinin, and activated carbon. In the case of pedunculate oaks, well-rooted plants from *in vitro* cultures, which reached a height of about 8 cm and root length 10–15 cm, were transplanted into tall containers while straightening out the root twisted during growth in the jar, and into appropriately prepared solid substrate. The seedlings were placed conditions similar to those *in vitro*, with temperature about 20°C, light exposure and high humidity, which was then gradually reduced.

In our research, alongside the main goal of cloning approximately 800-year-old oaks using *in vitro* methods, we strove to answer the question: what was crucial for the survival of shoots in the first month of *in vitro* culture and their preservation in subsequent months? Was it the age of the ancient oaks from which they derived, or more the individual genotype of the particular mother tree? Our findings were somewhat surprising, as they showed that for trees of various ages, the genotype of the mother tree was the decisive factor. At the same time, even the oldest plants we studied also showed the highest predisposition for micropropagation. Moreover, we found that not all ancient oaks could be reproduced using the *in vitro* method. However, the developed method made it possible to propagate (obtain a complete seedling with shoot and root) half of the monumental trees tested. However, the developed method allowed for half of the tested monumental trees to be propagated successfully (defined as obtaining a complete seedling with shoot and root).

Happy ending

The oak clones that propagated well and formed rooted in *in vitro* cultures, well enough that we could grow a full two-meter-tall seedling, were planted next to their mother trees or in other places in Poland to preserve for future generations their original, centuries-old genotypes.

On 12 April 2019, the first clone of a monumental oak obtained by the *in vitro* method was planted. This was a four-year-old seedling of one of the Rogalin oaks, one of the oldest oaks in Poland at approximately 800 years, which found a home near the Palace Museum in Rogalin, the former residence of the Raczyński family and now a branch of the National Museum in Poznań. The next tree – a clone of the Chrobry oak (the mother tree is already dead) with a genotype that formed around 1000 years ago, around 1025, when Bolesław Chrobry was crowned – was planted on 7 October 2022, near the Museum of the First Piasts at Lednica.

Cones of the Wybicki oak – which is about 500 years old and grows on the former estate where Józef Wybicki, the author of the lyrics to Poland's national anthem, was born – have been planted in several sites in Poland affiliated with Wybicki. The first two were planted next to the mother tree on the estate in Będomin (in 2019 and 2020), followed by another (in 2022) in Manieczki, where Wybicki died. A year later another was planted in Brodnica, which had been the site of Wybicki's grave for 100 years (before his ashes were moved to Poznań). In 2022, another clone of the Wybicki oak was planted in a park in Dobrzyca, the former estate of Augustyn Gorzeński, a friend of Wybicki's, followed by two more in 2023, near the Śrem Museum and Józef Wybicki Agricultural Schools in Grzybno.

Thanks to the collection of material and application of the micropropogation method under this project, clones of monumental oaks are also now growing on the premises of the PAS Institute of Dendrology in Kórnik and in the Arboretum of the Kostrzyca Forest Gene Bank. The authors of the project wish to thank the owners of the properties where we have been able to plant these oaks, the carriers of precious genetic heritage. ■

PAWEŁ CHMIELARZ

A seedling from the 800-year-old Rus oak tree, cloned in *in vitro* culture

The method of oak micropropagation was developed at the Institute of Dendrology of the Polish Academy of Sciences, with research funded by the Directorate General of the State Forests in Warsaw (project number: EO-2717-4/13).

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 DOI: 10.24425/academiaPAS.2023.147631

Art's Hidden Typology

When we look at works of art, our brain reacts to what we see in subconscious ways. Certain aspects of our perceptions can be captured using algebraic methods.

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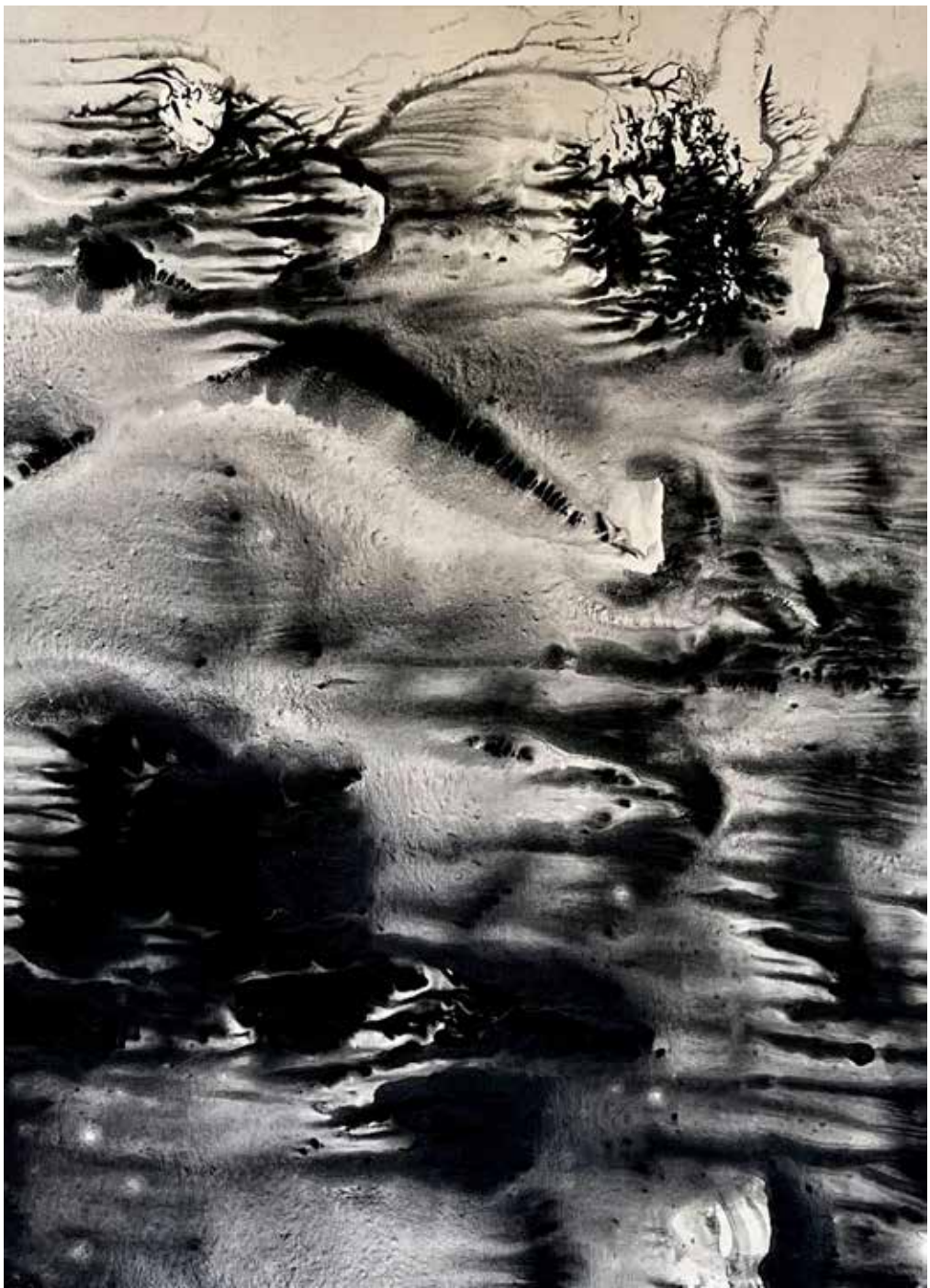

Image painted by Lidia Kot, "Three-Quarters of the Face of Blackness," Wozownia Gallery, Toruń, 19.11–26.12.2021

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Beata Bajno

Association of Polish Artists and Designers, Warsaw Section

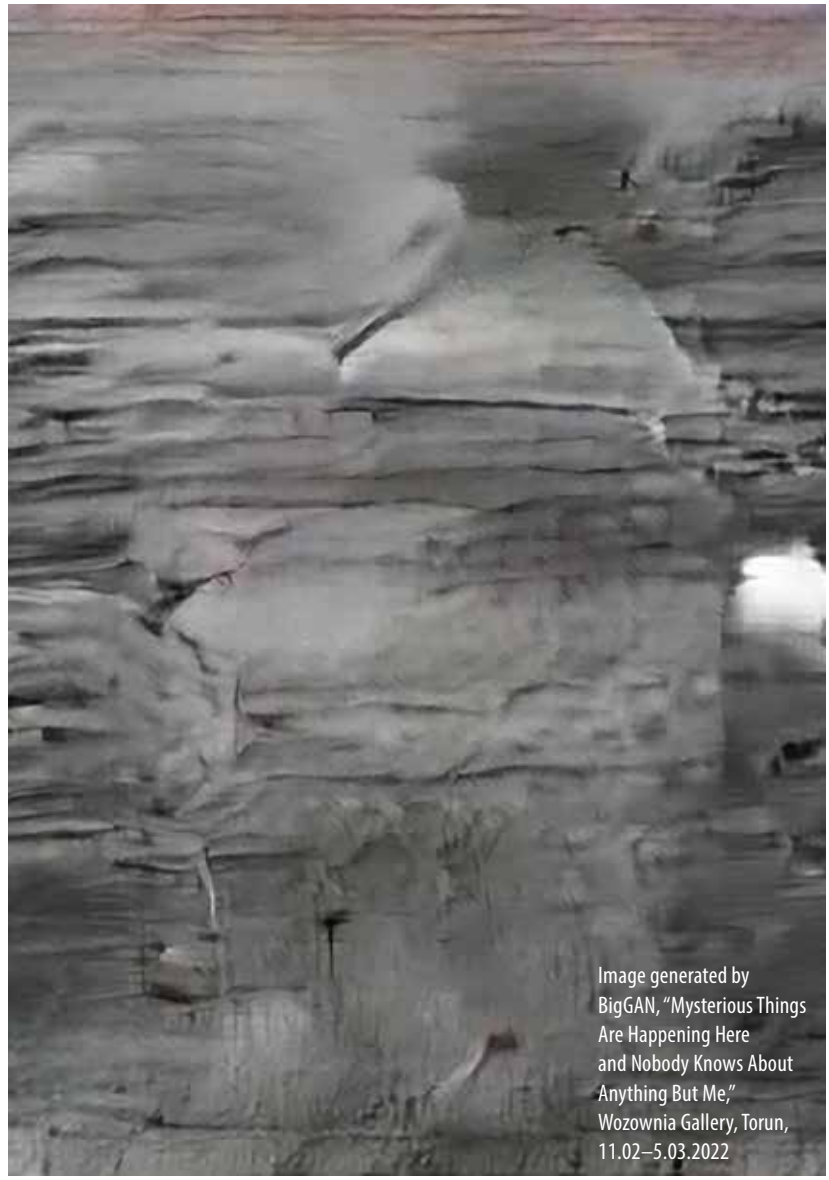

Image generated by BigGAN, "Mysterious Things Are Happening Here and Nobody Knows About Anything But Me," Wozownia Gallery, Torun, 11.02–5.03.2022

When we look at a painting, what is it that we observe? What catches our attention, and why? Do we look for hidden messages in paintings? Is it easy to create a visually intriguing image without being an artist? These are some of the questions we tried to address by carrying out a psychological and neurophysiological experiment, using both human-painted images and images generated by an artificial neural network.

The primary goal of the experiment was to measure people's physiological and psychological reactions to abstract images created by an artist and those generated by a neural network, and to check if those reactions differ. We stipulated at the outset that our goal *was* not to produce "artificial paintings" perfectly imitating "real" art, or to improve methods of doing so (although this might be possible by cleverly applying our findings). Moreover, the imperfect nature of the generated images allowed us to draw interesting conclusions and attempt to answer some of the questions mentioned above.

The experiment

In our experiment, two separate groups of visitors to the Wozownia Art Gallery in Toruń were each presented with a set of images: either 12 human-painted works, or 12 similar works generated by an artificial neural network. The original works by a human painter, displayed at the first exhibition, were the outcome of a continuous creative process, which included the selection of their final form. The second set of images was generated using BigGAN (Big Generative Adversarial Networks), a publicly available artificial neural network trained on millions of images of human surroundings. It can generate photorealistic objects in 1000 categories. We utilized the possibilities offered by its architecture to obtain abstract images based on the real objects on which the network is trained. For this purpose, certain network operations were randomly disrupted. This gave us a set of 4500 objects. To exclude the influence of simple differences resulting from different brightness or color intensity, each of the 4500 images was compared with each of the 12 human-painted works using a function calculating the difference between the parameters (color, intensity) of pixels of the two images. The average values of differences between the images allowed us to select 12 images least deviating from the chosen human-painted works. Randomly assigned titles for each of the computer-generated images and a short description of the exhibition to be published in the gallery's information leaflet were generated using the

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GPT-3 chatbot. This set of images was then put on display at a second exhibition, presented in a randomly chosen order.

The study looked at eye-tracking movements, EEG, and responses to questionnaires asking about the aesthetic and emotional feelings experienced by visitors while viewing images from both groups. The research was conducted during viewings at the gallery and at our lab, to which subjects were invited immediately after visiting the gallery. Here, the human-painted and network-generated images were presented on a computer screen. Data was collected twice, during and immediately after two consecutive gallery visits, one week apart. Study participants, and indeed all viewers of the exhibitions, were not informed about the nature of the study; the exhibitions were arranged and the works presented using methods aiming to avoid any prejudice towards the computer-generated images.

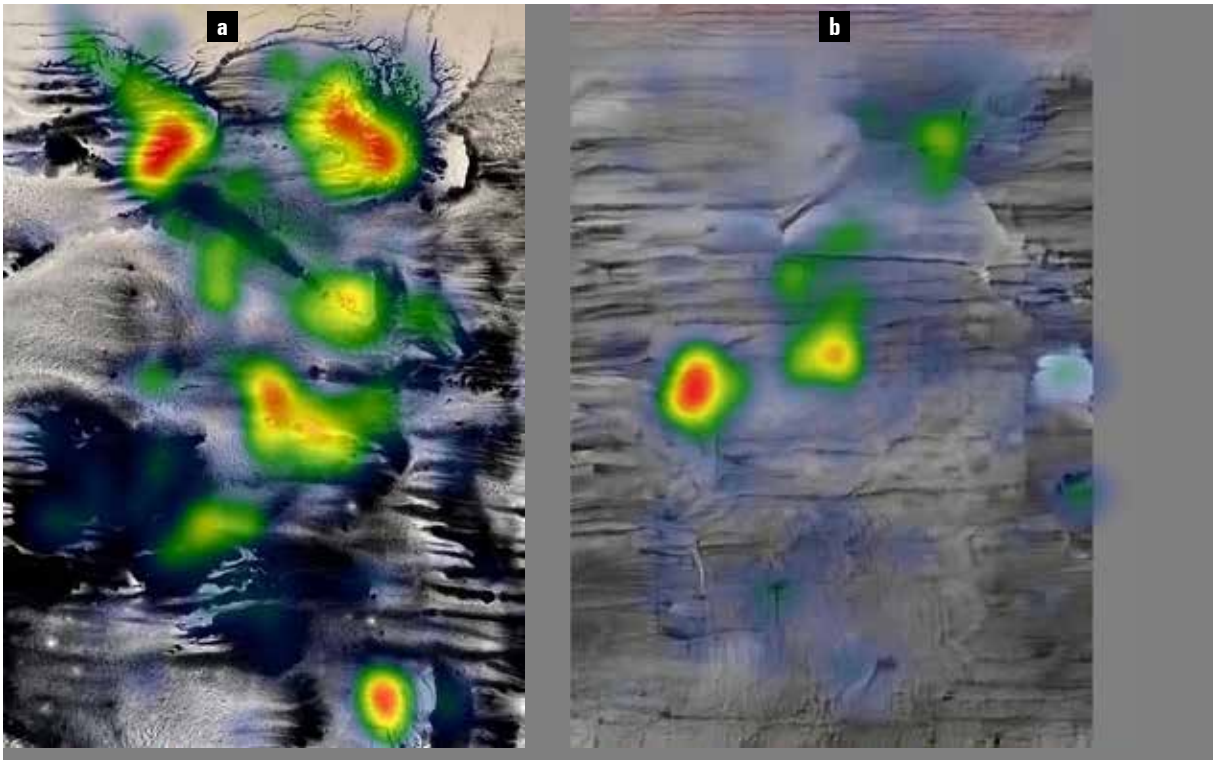
The study embraced a number of diverse experimental methods; in this article we will focus on the analysis of eye movements. In the simplest approximation, such movements consist of *fixations* – relatively stable eye positions focusing on a specific area of vision, lasting 150–600 milliseconds – and *saccades* – sudden eye movements shifting the gaze from one area to another. Fixations are an indicator of perceptual information processing. During saccades, suppression occurs – visual information intake is inhibited. The number and frequency of fixations turned out to be higher during the first visit to the gallery, when observing human artists' works. This effect did not occur for the works generated by the network. The amplitude of the saccades, in turn, is distinctly larger for the latter than for the human-painted works. This indicates that in the case of network-generated works, it is more difficult to find parts of the image that capture one's attention.

Perception

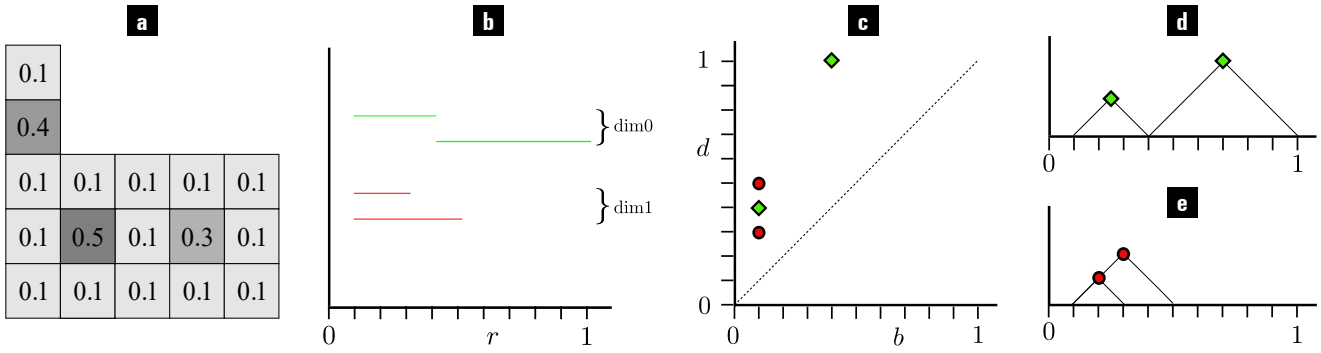
Analysis of eye-tracking data reveals, as expected, that observers focus on specific features of an image. It is reasonable to assume that our attention is primarily drawn to geometric objects. When we look at an image, we perceive entire structures composed of individual points/pixels (especially geometric structures), rather than individual points – in other words, we group discrete elements into larger units.

In perceiving geometric structures, we focus on the simplest patterns, such as distinct areas of a specific color or hue, or areas of one color against another. This places emphasis on topological rather than strictly geometric properties, although topology can be considered the most fundamental form of geometry. The rationale for our interest in topological properties alone is that they are independent of arbitrarily fixed coordinates and metric properties of perceived objects. In addition, topological properties are relatively immune to disturbances such as changes in illumination, visual acuity, or noise.

The basic concepts important for analyzing the topological features of datasets, irrespective of how



"Heat maps" of eyeball fixations, based on eye-tracking data. Averaged number of fixations for all subjects in the experiment for a human-painted image (a) and computer-generated image (b). The number of fixations increases along the color sequence: green – yellow – red



Topology and persistence:
a) an example structure where pixels are presented as squares of varying brightness (gray intensity). Intensity here is a good parameter for filtration, when looking at the image through filters that only allow pixels of sufficiently high brightness. If the most discriminating filter is applied, transparent only for the very brightest pixels (0.1 gray intensity on a scale from 0 to 1), the visible structure will consist of two disjoint pieces separated by an invisible pixel of intensity 0.4. One of these pieces will have two "holes" (invisible pixels of gray 0.3 and 0.5). The Betti numbers (described in the text) thus take values $\beta_0 = 2, \beta_1 = 2$. Using a more transparent filter will make the pixel of gray 0.3 visible and one of the "holes" will disappear, so then $\beta_0 = 2, \beta_1 = 1$. For a filter with even greater transparency, we will see the pixel of gray 0.4, which connects the two separate parts of the structure into one piece, leading to $\beta_0 = 1, \beta_1 = 1$. Finally, with a filter that also shows the darkest pixel of gray 0.5, the second "hole" will disappear – $\beta_0 = 1, \beta_1 = 0$. b) "barcode" representation, corresponding to the structure shown in a): dim0 refers to β_0 (zero-dimensional structures), dim1 to β_1 (one-dimensional structures), c) persistence diagram, d) and e) persistence landscape (see main text)

they are presented (e.g. as an image), are *filtering* and *persistence*. Imagine viewing a black-and-white image consisting of pixels in various shades of gray, through a filter that only allows shades above a certain intensity level to pass through. Clearly, using this filter may cause us to miss certain geometric structures formed by darker pixels. As we adjust the filter's transparency, some structures may appear or disappear. This procedure, whereby certain properties (geometric or topological) depend on a parameter (in this case, the transparency of the filter), is known as *filtering*. As the parameter changes, a specific structure may come into being or disappear. The range of the parameter across which a given structure exists is called its *persistence*. Structures with the longest persistence are the most significant and usually most characteristic of the object under study.

Topology in practice

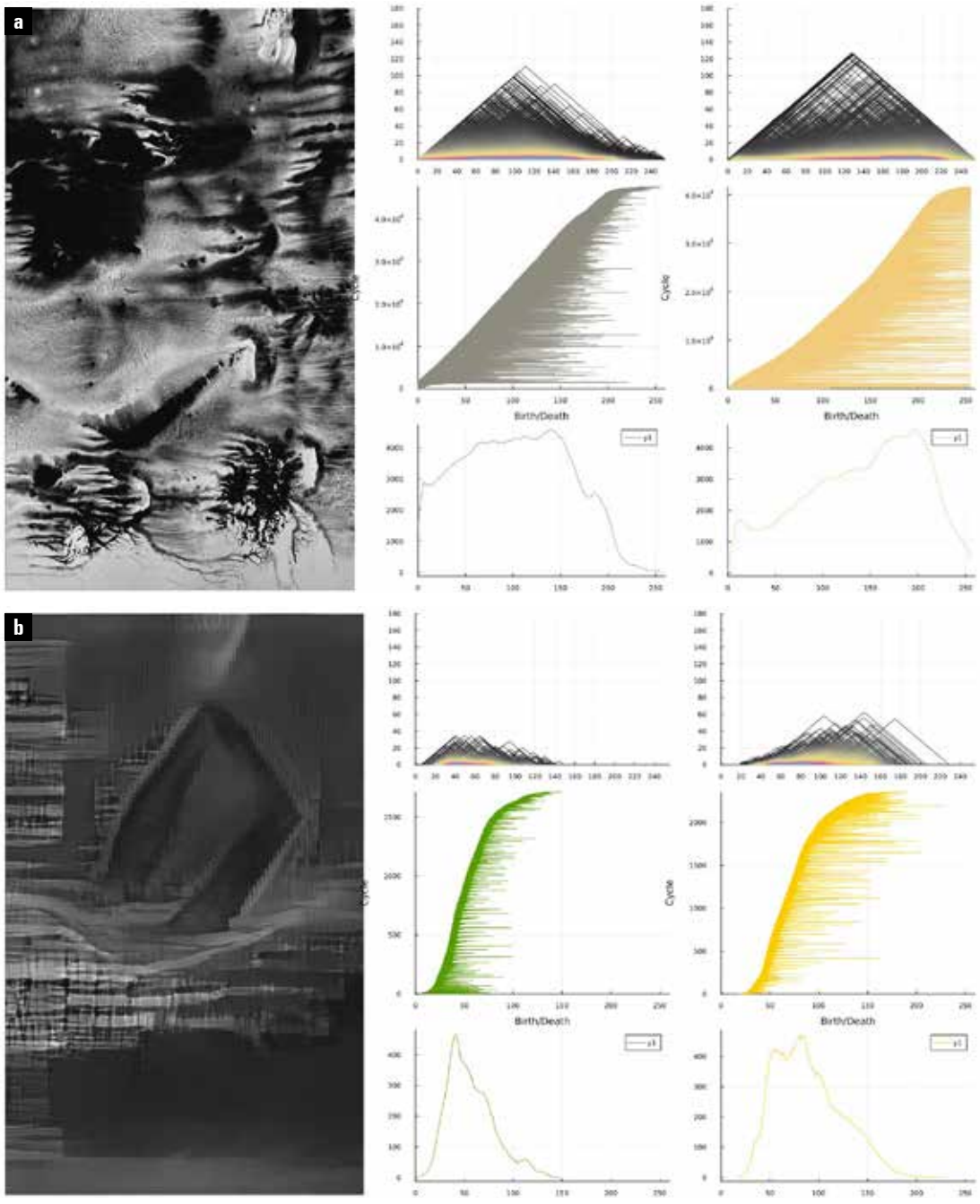
The field of mathematics that deals with the quantitative (essentially: algebraic) analysis and characterization of topological structures of interest and their persistence is known as *algebraic topology*. It tells us that for two-dimensional objects, such as images, two topological characteristics are important. The first is connectivity – the number of disconnected parts of a given structure (e.g., areas of the same color), the second is the number of "holes" in a given area (e.g., the number of areas of a certain color completely surrounded by areas of a different color). In algebraic topology, these numbers are known as Betti numbers, denoted as β_0 and β_1, respectively.

Several methods have been developed to represent the results of filtration. One of the first ideas was to use "barcodes." Each structure corresponds to a segment on a line parallel to the axis of the filtration parameter r, which begins when the structure appears (i.e. at point r_b) and ends when it disappears (at point r_d). Persistence can also be represented on a two-dimensional diagram with coordinates (r_b, r_d), called a persistence diagram. Naturally, points on this diagram occupy only the area above the main diagonal. By connecting each of these points to the diagonal with vertical and horizontal segments, we get a system of "pyramids" – isosceles right triangles. After this diagram is rotated by $\pi/4$, it becomes a *persistence landscape*. A good, global characterization of the variability of the entire topological structure in the filtration process is given the so-called Betti curve, which illustrates the sum of β_0 and β_1 for the entire area (image) depending on the value of the filtration parameter r.

Curiosity

Our analysis of sample images from the two exhibitions showed differences in their topological structure: in terms of both the richness of the persistence landscape and the "barcode." The shape of the Betti curves is also different.

Interesting conclusions can be drawn from analyzing the places where the most persistent topological structures emerge and disappear. Comparing heat maps of eye fixations with diagrams of topological structures indicates that fixations correlate well with areas where, from a topological point of view, there's "something going on" in the images with richer structure.



Topological properties of sample images from the two exhibitions: a work by a human artist (a) and a work generated by BigGAN (b). The second column shows the persistence landscape, the "barcode" representation, and the Betti curve (see main text) for zero-dimensional structures – connected components (dim0). The third column shows the same for one-dimensional structures – or "holes" (dim1). The images were converted to black and white, meaning pixels were assigned a corresponding level of gray depending on the intensity of the color of the original image. Essentially the same results are obtained by applying the color distribution to the R, G, and B components and determining the topological characteristics for each component

Many existing studies in the international literature have aimed to capture the relationship between viewers' aesthetic feelings and certain numerically quantifiable characteristics of artworks. Usually, the quantitative characterization was based on statistical properties, such as correlations of intensity, gradient, etc. In this part of our research, we were not interested in the aesthetic value of the works, and we based their mathematical characterization on topology, not statistics. We seek to capture the hidden information in works of art, which is contained in areas where interesting things happen from the point of view of topology.

Overall, we found that the topological properties of images are indeed related to the neurophysiological reactions of people viewing them. Images with a more complex topological structure reduce the intensity of scanning (the amplitude of saccades), while concentrations (fixations) are associated with areas where the topological structure is more complex.

ACKNOWLEDGMENTS
We thank the artist, Ms. Lidia Kot, and Prof. Romuald Janik for providing the artworks we used in our study: original paintings and appropriately selected images produced by BigGAN.

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Trees growing at the edge of a forest usually have a different shape and height than those deeper in the forest interior. It is important to keep this in mind when choosing a sample of trees to measure or study

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Reflections in a Distorted Mirror

Mathematics offers tools renowned for their objectivity, which is a cornerstone of scientific inquiry. Yet the question arises: how accurately do statistical methods really reflect the complexities of the real world?

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The field of statistics is part of the broader research methodology that uses mathematical methods to describe and understand the world. The overall picture of the world we obtain needs to be free from speculation and invention, and as objective as possible – in other words, we want it to be true and well-aligned with reality. Statistical methods can greatly assist in this. Nevertheless, at the same time, overreliance on such methods and insufficient awareness of their potential pitfalls can instead easily distort the real world.

Following the scientific method, we formulate hypotheses that can then be confirmed or refuted.

As evidence in favor of one conclusion or the other, methods and criteria based on statistical analysis are often applied. This requires an appropriate dataset. However, careful data collection is just the beginning. It must be followed by careful verification, processing, and proper analysis. Biologists often use statistical techniques in conjunction with software that performs calculations, computes correlation values and the significance level of differences, etc. However, it is up to the individual researchers to make decisions about which type of analysis to apply and how to verify the initial assumptions – such as sample size, normal distribution, or homogeneity of variance. Unfortunately, these important steps are often skipped, which is a serious mistake that undermines the entire reasoning process.

Precision

When we study a particular phenomenon, how authentic our picture of it is will depend in part on the quality of our data, in other words, on its *precision*. For example, we can measure both the height of a tree and the annual growth in its thickness, but each of these measurements will require a different level of precision. Determining a tree's height down to a fraction of a millimeter, while technically challenging, will add little of substantive value. Similarly, measuring human lifespans down to the second, or the geographical coordinates of large objects with centimeter precision, is quite simply unnecessary.

Even leaves growing on the same shoot can vary greatly in size and shape – this is something that must be borne in mind if we want to make a correct analysis of such characteristics

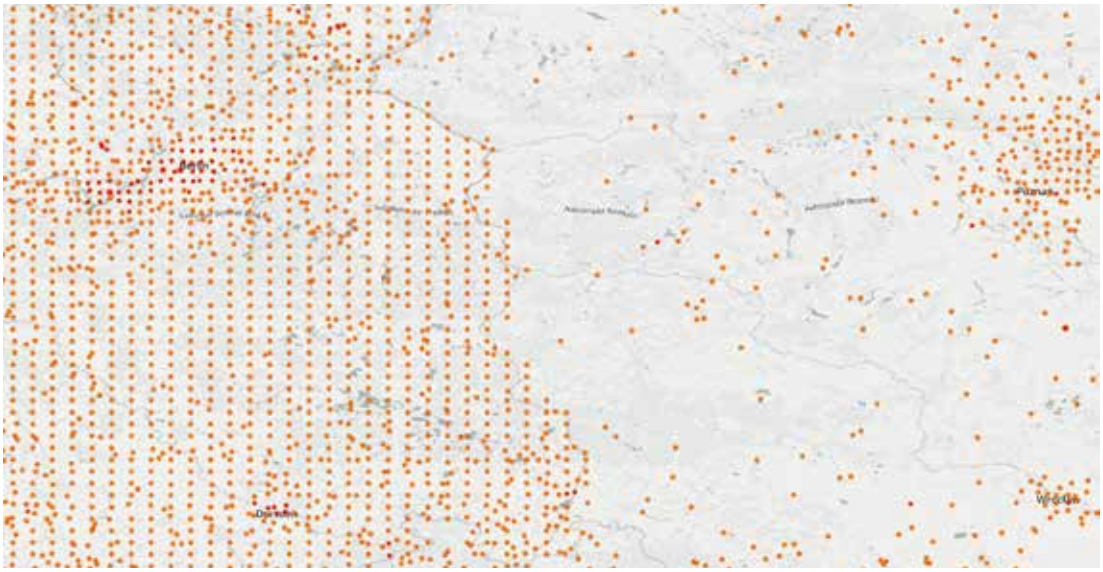
However, among the wide spectrum of possible methodological errors, excessive precision is certainly not the worst. A more critical error is using a *non-representative sample*. Rarely do we study an entire group (i.e. the general population), because statistics has developed methods that permit sound analysis using only a selected part of that group (a sample). But the caveat is, the part that is analyzed must be *representative* of the original, larger set. Only such a sample allows us to draw conclusions about the general population. For example, if we are studying the height and canopy structure of trees in a forest, using a sample consisting predominantly of edge-growing trees (or a disproportionately high share of such trees in our sample) is not a good idea, as edge trees tend to be shorter and lower-branched than those growing deeper in the forest interior. An excess of such trees in the sample will distort our resulting picture of the general tree population. This example shows that if we lack sufficient knowledge, we might make a fundamental error just by inadvertently choosing a non-representative sample. Even if all subsequent statistical analysis steps are correct, the conclusions will be unjustified.

Herbaria

One of the preconditions for a properly-selected sample is that it should be selected at random. If such randomness is achieved, we can assume the sample will be representative. However, full randomness is often difficult to attain. Studying the specimens gathered in *herbaria* – collections of pressed and dried plants that have been gathered by scholars, generally labeled with information about their systematic classification, where and when they were collected, and by whom – can serve as a good example here. Herbaria are certainly rich sources of biological data on plants: the drying process preserves their structure quite well, and in addition, genetic material can be extracted from them for research of various kinds. Herbaria currently store hundreds of millions of plant specimens from all over the world from all systematic groups. Although many such collections were mainly accumulated in the last century, quite a few of them span a much broader time range, with the oldest specimens dating back as far as nearly 500 years.

Herbarium specimens are relatively easy to access and reference, and so are often used in botanical research – such as in biometric analyses dealing with such characteristics as the dimensions of leaves, fruit, or flower parts. However, certain methodological difficulties arise here. The first problem is the issue of randomness. Ideally, a research sample should consist of *stochastically* (that is to say, randomly) collected individuals, but a collector out in the field typically violates this criterion by selecting plants that piqued his or her interest for some reason (being exceptionally small or large, easy to collect and dry, exhibiting a rare flower or leaf coloration, an unusual shape, etc.). This introduces a non-random element to the selection process, which means that the distribution of characteristic values in the sample will most likely *not* reflect that of the general population.

Another danger inherent in using herbarium specimens for research purposes derives from the drying process itself. Plant tissues contain a lot of



SOURCE: GBIF

This map of data on the occurrence of the common nettle in eastern Germany and western Poland reveals not so much an authentic picture of the species' distribution, but rather the existence of very different levels of availability of data on biodiversity

water that is removed in drying, which can significantly alter organ sizes and sometimes even the color of leaves or flowers. Experienced collectors, aware of this, often specifically record the original color on the herbarium label. For instance, in our study of about 20 species from different groups, we found that leaves lost 52–86% of their mass during drying, and their surface area decreased by 3.5–15.2% (reports in the literature indicate that the decrease can be even greater). Using methods to quantify shape changes with elliptical Fourier coefficients, it can be shown that the original form of leaves is not preserved after drying. While dried leaf blades generally do not look completely different and a botanist can still correctly identify the species, someone who does not take such changes into account and analyzes a dataset that, for instance, combines measurements of fresh and dried leaves will be making a serious methodological error. This, of course, will affect the results and their subsequent interpretation.

Big data

In many situations, problems related to the size and randomness of a sample can be solved by analyzing sufficiently large datasets ("big data"). Current IT tools and access to large amounts of data from various sources are nowadays allowing scholars to work with collections comprising not of tens or hundreds of datapoints, but hundreds of thousands or millions. In the field of biology, an excellent example of this can be found in biodiversity data. Thanks to the relatively recent processes of digitizing biological collections, the quantities of easily accessible data on the recorded occurrence of various species is growing each and every month. However, even such a huge collection is not perfect. Having even millions of points on a map indicating the occurrence of individual plants or animals still tells us nothing about the millions more that are potentially not represented there. This is illustrated well by observations of the occurrence of the common nettle (*Urtica dioica*), a species very common in Poland and Germany. The recorded distribution of the nettle looks surprising, exhibiting a large number of occurrences west of the Oder River but far fewer east of it. Each recorded observation is true, so why is the resulting overall picture nevertheless not accurate? The key lies in a bias concealed in the dataset. Since the biodiversity database in question (the world's largest: the Global Biodiversity Information Facility) happens to include an insufficient number of observations from Poland, this region is underrepresented, and so the distribution looks different on either side of the Polish-German border, which runs along the Oder River. As this example serves to show, processes of data digitization and transfer to global databases are not proceeding equally swiftly and efficiently in all countries, and so the resulting databases can be biased in various ways – the data structure is somehow skewed or distorted. Over time, of course, this should eventually work itself out, and then using big data will indeed allow for an even better, more authentic description of the world.

In summary, the landscape of biological research is fraught with challenges and potential missteps. Biologists must navigate carefully, ensuring that their methods of analysis align seamlessly with the nature of the data and the specific research questions at hand. Vigilance is key in avoiding the misinterpretation of results – even when those results themselves are accurate. Thus, in the realm of data collection and subsequent analysis, a conscious effort to sidestep these numerous pitfalls is essential for the integrity and accuracy of scientific conclusions. ■

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Information Quality on Wikipedia

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Wikipedia, one of the world's most popular websites, owes its success to its authors – i.e. to all of us. But how do we know if the information it offers is reliable?

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The unrestricted nature of the Internet makes it possible to be exposed to a wide variety of viewpoints and opinions. There are, at present, over a billion websites offering information on various topics. Over many years, Wikipedia – a publicly accessible and editable encyclopedia – has risen to become one of the most well-known online sources of information. It currently contains over 60 million articles in more than 300 languages, making knowledge accessible to people from diverse cultures and regions. Additionally, many popular websites and tools (including Google's search engine and ChatGPT) currently utilize content from Wikipedia to improve the quality of their services.

A comparison of the different names used for quality classifications in six language versions of Wikipedia: Belarusian (be), German (de), English (en), Polish (pl), Russian (ru), Ukrainian (uk)

Grade / Language	be	de	en	pl	ru	uk
Featured Article (FA)	✓	✓	✓	✓	✓	✓
A-Class			✓			
Good Article (GA)	✓	✓	✓	✓	✓	✓
Solid					✓	
B-Class			✓			
Four				✓		
Full					✓	✓
C-Class			✓			
Developed					✓	✓
Start			✓	✓		
In development					✓	✓
Stub	✓		✓	✓	✓	✓

Wikipedia operates based on an open-editing model, meaning that anyone can create and edit the content of articles on the platform. As a result, information can be updated almost instantly, and the website can respond quickly to current events and discoveries. Community editing (including by anonymous users) allows errors to be corrected and for the content to be continually improved.

However, Wikipedia's open co-editing model also has its drawbacks. For example, encyclopedia articles are susceptible to deliberate misinformation and damaging content. Because it is not required for each and every change of content to be reviewed, harmful changes can immediately become visible to other Wikipedia readers. This inevitably leads to errors and inaccuracies in some texts. Moreover, Wikipedia articles can sometimes be biased, especially if edited by people with vested interests in a particular topic. In addition, the fact that anyone is able to edit articles can lead to conflicts between editors, over the specific content of articles or over how to interpret the rules.

Yet despite all these drawbacks, the overall philosophy of allowing anyone to edit Wikipedia has been, and indeed continues to be, key to its global success. Articles on this platform are co-created by volunteers from around the world, making it highly dynamic and able to keep up with the pace of events. More than half a million edits are made to Wikipedia every day, which means it would be very difficult to manually monitor all the changes.

Give that article a medal!

In each language, Wikipedia is created by a unique community of users, who shape and interpret the quality standards for their particular language version. Therefore, each version has slightly different criteria for content quality based on community discussion

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and experience. As a rule, each language version has special awards for articles that have achieved the highest quality standards.

In Wikipedia's most well-developed language version – English – the status of "featured article" (*FA*) is given to articles written in exemplary fashion, that meet all the quality criteria for this language version and so are worth emulating. "Good article" (*GA*), in turn, is a status given to articles that are close to meeting the standards of exemplary articles, but do not yet do so 100%. In the Polish-language version of Wikipedia, for instance, such content is referred to as *artykuł na medal* "top-notch article" (literally: "deserving of a medal") and *dobry artykuł* "good article" (two statuses analogous to the *FA* and *GA* classes in the English language version).

Before receiving one of these coveted distinctions, an article is subjected to careful and thorough scrutiny by the community. Users decide in open discussions whether a particular Wikipedia article meets the established criteria. Everyone can present arguments for and against awarding a particular status. Notably, the rules for awarding these distinctions can evolve and may be adapted to the needs of a specific language version. Such changes can lead to situations where certain articles may lose their previously granted status.

Some language versions of Wikipedia have a more developed quality-rating system that indicates how close an article is to achieving model status. In the English Wikipedia, articles are classified in seven quality categories, from highest to lowest: *FA*, *GA*, followed by *A-class*, *B-class*, *C-class*, *Start*, *Stub*. It is worth noting that quality grades lower than *FA* and *GA* can be individually assigned by users, without the need for discussion or community consensus. In the Polish Wikipedia, apart from the highest distinctions, articles are generally classified as: *czwórka* ("four," borrowed from the term for "B-grade" in school), *start*, and then *zalążek* ("stub"). Moreover, even within the same language version, different thematic sections of the encyclopedia may employ different names for similar quality grades.

The overall picture, therefore, is that while Wikipedia has standards for quality assessment, these criteria can vary depending on the language version and also may change over time. Moreover, judgements are often subjective, requiring collaboration and agreement among editors. All this means that automating the content-quality assessment process in Wikipedia could greatly contribute to improving the credibility and efficiency of edits. Algorithms, after all, operate often on quantitative measures leading to more consistent assessments in more objective way, without emotional or subjective interference. This will also allow for the automatic collection of large amounts of data to get quality measures for billions of documents and faster identification of problems related to their content.

Computer tools can quickly identify vandalism or misinformation, providing editors with up-to-date information and suggesting corrections. Additionally, in the case of deliberate disinformation attacks, such tools can act as a defensive mechanism.

Our team at the Department of Information Systems at the Poznań University of Economics and Business is engaged in research on automated evaluation of the quality of Wikipedia articles. Some of the models we have developed and reported in scientific publications have been implemented on publicly accessible websites. For example, the WikiRank.net project allows users to check the quality and popularity of Wikipedia articles in different language

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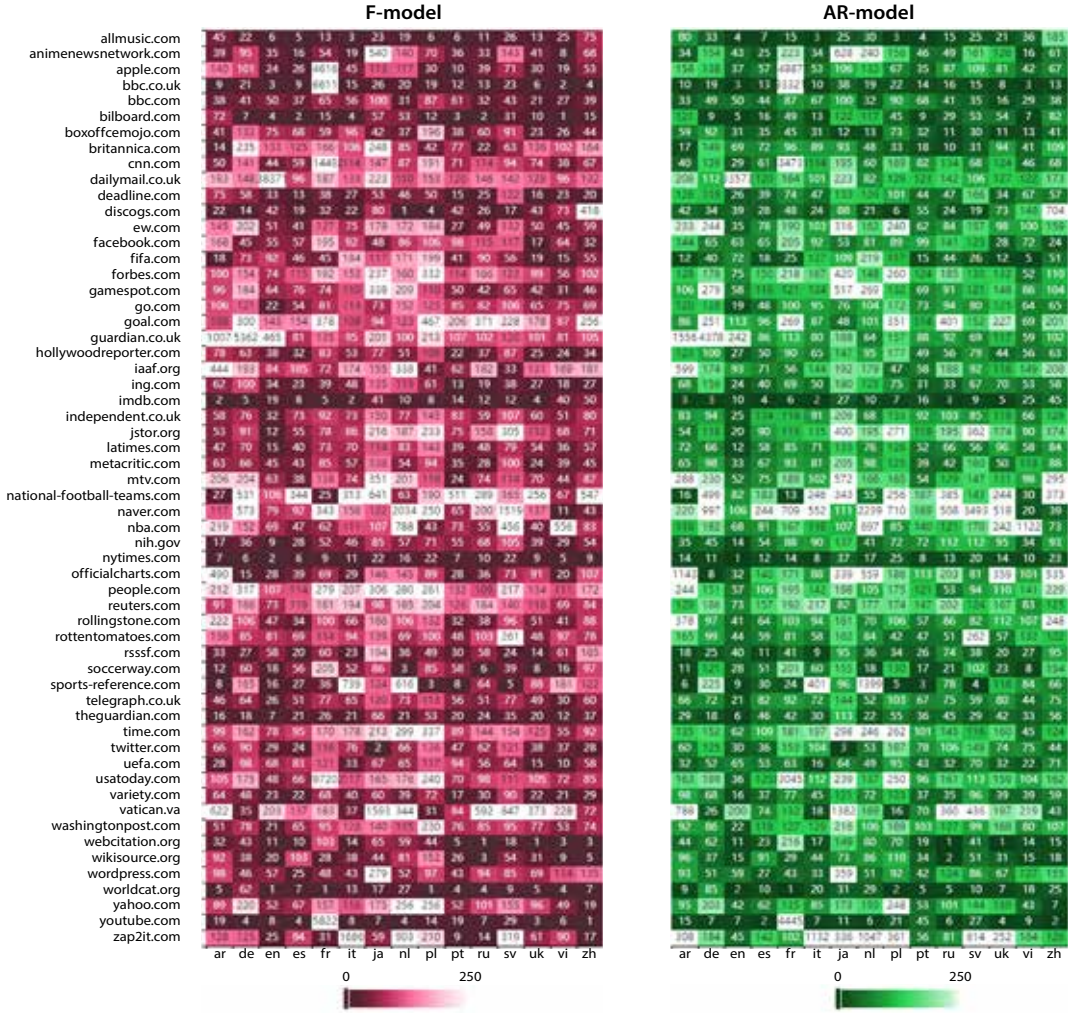


The aggregate rankings of the most important sources of information cited by Wikipedia articles related to culture in the broadest sense of the term

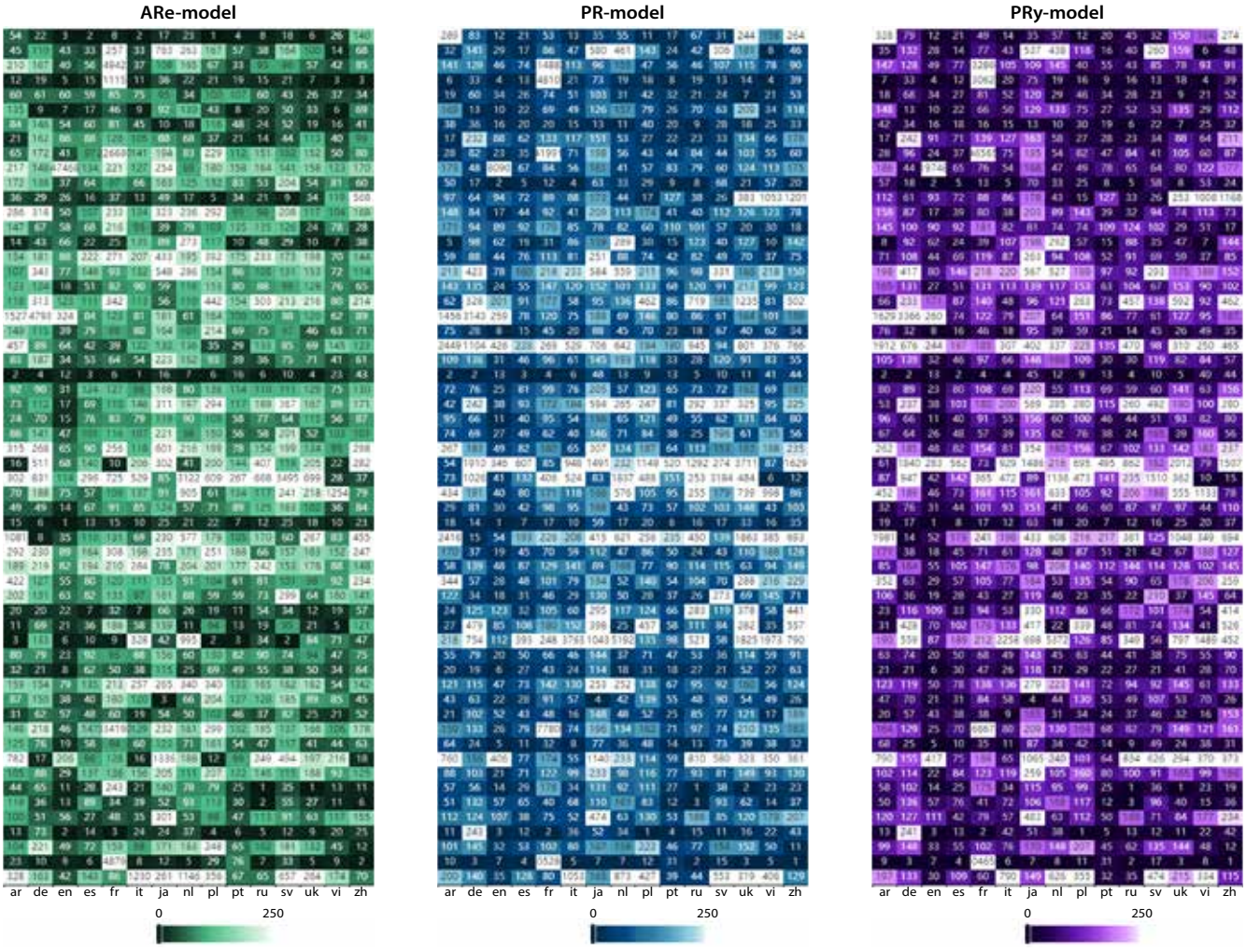
versions. Another example is the BestRef.net project, for analyzing the importance of information sources on Wikipedia.

Reliable information sources

A key aspect of Wikipedia article quality is the principle of verifiability of information. This means that the information in the encyclopedia articles must be based on reliable, credible sources. However, how source reliability is judged can vary, depending on the specific subject of the article and the Wikipedia language version. Additionally, the reliability of a source depends on factors such as the reputation of the publisher or author, the review process, and the accuracy of the information presented. When evaluating sources to be cited in Wikipedia, editors should aim to choose those with a good reputation and are widely recognized as reliable in their fields. However, the biggest challenge posed by the concept of source reliability (much like the concept of information quality) is the subjectivity of the evaluation process. This means that Wikipedia editors must reach a consensus on every information source that can be used in Wikipedia articles.

Only a few of the well-developed language versions of Wikipedia provide even a non-exhaustive list of sources whose reliability and application in Wikipedia have often been debated. Even the English Wikipedia (the largest version) has such a general compilation of reliability information for only about 400 websites. Sometimes we can find similar lists for specific topics (e.g., video games, movies, new articles in English Wikipedia). Given that there are over a billion websites on the web, assessing the reliability of each of them individually would pose a huge challenge. Additionally, it must be borne in mind that the reputation of the very same source can change over time, which may require further regular reliability assessment.

Automating the source-assessment process can help quickly identify sources that are potentially unreliable, outdated, or do not meet academic standards, allowing editors to focus on scrutinizing them or replacing them with more credible sources. Additionally, in this age of rampant misinformation, auto-



matic source-assessment can quickly detect and flag information that is based on dubious sources, preventing it from spreading. Moreover, new Wikipedia editors may not be sure which sources are most reliable in a given field. Automatic source assessment can provide them with guidelines and recommendations, helping them to choose appropriate source materials.

A study of all Wikipedia articles in all the different language versions showed that there are over a million different websites that are used in over 300 million references of Wikipedia articles. In the most developed language version (English), nearly 77 million references can be identified, and about 8 million in the Polish-language version. Using various models for assessing Internet sources, we can identify the most important ones from the standpoint of individual language versions of Wikipedia.

Semantic databases

The advancement in semantic technologies has greatly enhanced the efficiency of processes like information retrieval, sentiment analysis, and content summarization. Two good examples here are the platforms DBpedia and Wikidata. DBpedia transforms Wikipedia data into a format more accessible for machines, while Wikidata acts as a centralized database for all Wikimedia projects in various languages. These platforms not only facilitate structured knowledge access but can also be used to improve the overall quality of Wikipedia in different languages. On the other hand, higher quality content on Wikipedia also contributes to higher quality in these semantic knowledge bases.

Wikipedia, Wikidata, and DBpedia are open resources that allow their content to be used for various purposes. Better quality of these resources, in turn, can contribute to improving other a wide array of services and applications that use open data, including: internet search engines, natural language processing applications, educational applications, recommendation systems, virtual assistants, cultural and tourism applications, network connections, and many more. ■

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On Modelling

and Dedication

CEZARY PIWOWARSKI

We discuss econometric modeling with **Prof. Aleksander Welfe** from the University of Łódź and Warsaw School of Economics (SGH), Vice-President of the Polish Academy of Sciences.

What is an econometric model?

First, let's consider what a *model* is. It's a fundamental concept used not only in economics or econometrics, but also in most disciplines that are not exclusively theoretical. Broadly speaking, a model is a prototype of some system, showing how it works. Some models are physical, existing in material form, like a scale model of an airplane tested in a wind tunnel. This example also illustrates why models are created – in order to observe, in a simplified way, how a given system works. The main feature of models is *simplification*. In order to explain how a system works, they have to focus only on certain features of that system, ignoring the rest.

So, the purpose of creating a model is to explain certain observations, not to forecast what will happen?

Nicolaus Copernicus, a colossus in the history of science, constructed his model of the Solar System not to forecast but to explain how it functioned and to answer specific questions. Why do we have night and day? Why are there seasons? Why is it colder in the north than in the south? Why are there lunar and solar eclipses? None of the pre-Copernican concepts could explain all these phenomena simultaneously. Only Copernicus' model provided answers, although it was of course a simplification of the real system. It was years later that his descriptions of the paths of the planets were found to be not entirely accurate.

Models of social or economic systems are often criticized on the grounds that they describe systems that are in constant change. However, many scientific

disciplines have to build models for changing systems. Naturally, one useful way models can be applied is in forecasting, predicting how a system will behave in the future. If a model deals with a changing system, such a forecast will be prone to a certain error, but every effort is made to make it as accurate as possible. And this is by no means impossible.

Such a forecast, for instance, is a mandatory part of every business plan presented to a bank when applying for a loan: it has to make some assumptions about the rate of inflation, the projected demand for products the company wants to sell, etc. It is best for such forecasts to be based on formal models. The models used in economics are not physical models, but systems of mathematical equations with specific parameters, which are estimated based on a sample.

Now that we are clear on what a model is, can you explain how an econometric model differs from an economic one?

A simple economic model can be expressed in words. But nowadays models generally take the form of systems of mathematical equations. We can then examine the stability of such a system, whether it tends to return to some kind of equilibrium path or not, whether it is dynamically stable. This is the kind of thing that mathematical economists study. All equations have certain parameters. In economic theory, we can define ranges for their values. For example, the *marginal propensity to consume* (MPC), a parameter that reflects how much of every unit of increased income will be spent on consumption, is defined as falling in the range 0–1. But that range contains infinitely many real numbers. And the difference between a MPC value of 0.93 and 0.96, for instance, can be fundamental. The way the entire economy will react to higher household incomes may be completely different in these two cases, e.g. either triggering a Keynesian multiplier or not. We don't know what the actual MPC value is for a given economy; that value has to be estimated. In econometric models, parameters like these are the subject of estimation, based on a sample of data. Such a sample is simply a snapshot of how this system has behaved in the past.

Prof. Aleksander Welfe

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CEZARY PIWOWARSKI

ALEKSANDER WELFE

Can an analogy be drawn between the relationship of econometrics to economics and, for instance, the relationship between theoretical and empirical physics?

Such analogies could be drawn to any scientific discipline that has a related applied field. Econometrics arose from the combination of mathematics (or more precisely: mathematical statistics) and economics. The name *econometrics* is a combination of two words: *economics* and *measurement*. The term was first used in 1910 by the Polish mathematician Paweł Ciompa in his work, *Zarys ekonometryi i teorya buchalterii* [An outline of econometrics and the theory of bookkeeping], published in Lwów in 1910, but it is Ragnar Frisch and Jan Tinbergen (winners of the first Nobel Prize in Economics in 1969) who are considered the fathers of econometrics, developing the field in the 1930s. From the historical perspective, compared to mathematics, medicine, or even physics and chemistry, econometrics is a very young discipline, barely a century old.

How can we define econometrics as a science?

Econometrics has two main pillars: methods and applications. The methods are an extension of mathematical statistics. Applied econometrics is an empirical science that verifies (economic) hypotheses based on statistical data. Empirical models are created, which can be tested, used in forecasting, and more broadly – in decision-making processes. Data can be in the form of time series, cross-sectional, or longitudinal (panel) data.

Does econometrics ensure the authenticity of economic data?

That's not something econometrics deals with, because econometricians do not collect data. We most often make use of existing databases. These databases are created by the statistical offices operating in various countries, by various organizations, including international ones, or collected for completely different purposes (e.g. by surveyors), and then used in econometrics. Some of this data is made public, some is kept confidential. Some researchers apply for access to certain not fully disclosed data and usually obtain it. This data can be macroeconomic, concerning the whole economy, or microeconomic, concerning individual entities. An example of the latter could be information collected by tax bureaus. It should be emphasized, of course, that such data gets anonymized before being passed on for research purposes.

Can econometric models help us to predict what will happen, for example, in Poland in the next 5–10 years?

Of course, but I haven't prepared such a forecast for this interview. And to do that responsibly, I would have to set up a whole econometric model. But such forecasts do indeed get prepared. In my opinion, this is an area of research that should be more strongly developed. I believe that in Poland, most central and government offices (such as the National Bank of Poland, the Ministry of Finance, the Ministry of the Economy, the Ministry of Family, Labor and Social Policy) should base their analyses not only on econometric models but also on other formalized constructs. Armed with results obtained using such tools, expert teams would make completely different decisions. Worldwide practice in this regard demonstrates that a wide range of models, depending on their type and data sources, are used for forecasting, with time horizons spanning from mere minutes up to 10–15 years or even longer. For example, decisions about buying or selling financial instruments are often guided by models that rely on intradaily data, whereas decisions regarding the construction of a car factory must take into account demand projections spanning the next 10 years or even longer.

> Models of social or economic systems are often criticized on the grounds that they describe systems that are in constant change.

Do technological advancements, including the evolution of artificial intelligence, contribute to the development of these econometric models or the methodologies used to construct them?

Some of the earliest empirical econometric models, developed by the Dutch economist Jan Tinbergen, were commissioned by the League of Nations prior to World War II. These models required the collaborative efforts of entire teams of accountants. People would sit in rooms and perform a series of calculations using mechanical calculators, which were then compiled to obtain the final result. In my own experience, I began working with mainframe computers that were as large as wardrobes – the disk stack alone was the size of a washing machine. Nowadays, if I want to I tackle a probabilistic problem, I can run a program on a personal computer that generates 10 million samples from a specific distribution, ensuring reliable statistical inference. If I let the PC run for two nights, I'll have the calculations completed. This represents a tremendous advancement. As for tools like ChatGPT, I expect they will streamline certain processes, but they will not replace the conceptual work.

Does the position of Vice-President of the Academy give you a different point of view on the science-funding situation in Poland?

I've certainly been receiving a lot more information lately about the funding situation of the Polish Academy of Sciences, and that has significantly altered my perspective. In my view, the funding allocated to the PAS institutes is undeniably inadequate, and these institutes serve as the core hubs for scientific advancement within the Polish context. Without a substantial increase in resources for these institutions, they are at risk of collapse. There will be a shortage of young and talented staff members. It's crucial to attract the best young minds to join research teams. Consider a young individual who completes their undergraduate studies at the age of 24–25, pursues a doctoral degree over the next few years, and shows promise as a scientist, but during this time they also start a family, which comes with various financial responsibilities. If such an individual finds it challenging to make ends meet while working at a Polish Academy of Sciences institute, they will probably seek employment elsewhere, more likely in the private sector rather than at a state university. Therefore, unless there is a radical shift in the funding of PAS institutes, the outlook appears quite challenging. This situation extends to the entire realm of science in Poland.

Can the new Act on the Polish Academy of Sciences improve the financial situation of the institutes?

If the proposed draft that has been submitted by the PAS-affiliated community gains the favor of the new parliamentary deputies, senators, and ultimately the President, then perhaps new opportunities for obtaining financial resources will open up. The separate PAS institutes have legal personality and can win grants, whereas although the Academy itself (the central body) is a state institution and has legal personality, it does not have the capacity to obtain grants or conduct business activities. If something like our proposed law is implemented after the entire legislative process, there is a chance that the situation will improve.

Could you see yourself working in a different profession?

I've always been drawn to scientific work, so if I weren't an econometrician, I imagine I would be involved in some other field. This kind of work has always been a great fit for me. While it leads to a more modest lifestyle compared to those in the business world, it offers something unique and invaluable – a genuine sense of freedom throughout one's professional journey. This freedom arises from the ability to explore topics of your own invention. There's no external force or troublesome boss capable of halting you effectively. If you have a promising idea and a grant, you have the funding to secure access to the necessary equipment and data. In many disciplines, including mine, the primary tool is computers. I have the flexibility to focus on any particular research problem I formulate. Show me another profession anywhere in the world that offers this level of freedom, where I can pursue my interests and still get paid for doing it!

It's somewhat akin to the work of an artist.

This is the bright side of this profession. However, there's also a downside to it, which involves the fact that you're never really "off the clock," and there's always something vying for your attention. Real vacations are hard to come by, because your mind is constantly preoccupied with thoughts about your research work or what else you could be doing. There's a perpetual need to validate yourself as a scientist, which means consistently publishing, submitting, and facing the disappointment that can come with article rejections. Despite having a substantial body of work and a reputable position, one must continually face the discomfort of potential rejection and disqualification. However, there are many other professions where a similar process occurs. Accomplished actors, even those with Oscars to their name, still attend auditions, and after each one, they either receive a callback or they don't. So, while the situation of scientists is not entirely unique, it can be quite frustrating. These are the challenges of this profession, but they don't overshadow the positives.

CEZARY PIWOWARSKI

Would it be accurate to say that scientific work is something more than a profession for you?

I'd describe it as more of a passion than merely a profession. Perhaps the term "dedication" fits well in this context. However, deep dedication to one's professional activities isn't limited to science alone. For instance, one can be an incredibly dedicated teacher. Personally, I find teaching work extremely fulfilling. Each year, when I step into the classroom for the first lecture with new students, I feel a slight sense of stressful excitement. I want the lecture to be exceptional because these are new individuals who want to get to know me, and vice versa. Our whole collaboration hinges on this initial impression. Despite having 40 years of experience, I prepare myself for each and every lecture, and on the day before, I always take at least a moment to envision what I'll discuss the next day. It might sound commonplace, but being deeply dedicated to one's professional work applies not only to scientists or artists, but to any profession. Every occupation has the potential to become someone's passion.

Interview by
Jolanta Iwańczuk, Daniel J. Sax

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Between Truth and Authenticity

PAWEŁ BARANIECKI

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KAMILA BARANIECKA-OLSZEWSKA

"Łabiszyn Encounters with History" is one of Poland's largest historical reenactment events

Historical reenactors are not merely mad eccentrics; they are also earnest history aficionados eager for us to learn from the past – says **Kamila Baraniecka-Olszewska** from the PAS Institute of Archaeology and Ethnology in Warsaw.

How do you interpret the significance of historical reenactments?

KAMILA BARANIECKA-OLSZEWSKA: To me, historical reenactments are fascinating as a form of cultural performance and a means of representing historical events. My earlier research in the anthropology of religion focused on Passion plays, staged during Easter. Later, applying the same theoretical framework, I shifted my attention to historical reenactments.

What really draws me to these reenactments is how they connect with our current times. They're more than just historical narratives viewed through a modern lens. It's remarkable to see how individuals deeply entrenched in modern lifestyles can nevertheless adopt roles from the past and fully engage in the recreated environments, which operate on principles drastically different from their everyday lives.

My primary research area has been World War II reenactments, which involves a shift to rather extreme conditions. On the one hand, such reenactments portray wholly different, almost inconceivable experiences, and on the other, they entail entering into highly hierarchical structures. It's also important to acknowledge that these are predominantly military reenactments with a masculine emphasis. Although women participate, the overall tone of these events is heavily male-oriented and militaristic.

What motivates people to participate in historical reenactments?

My research indicates that reenactors are primarily driven by a desire to empathize with others, to understand what it's like to be in extreme circumstances. They do not want to really trade places with historical figures or relieve the horrors they experienced. Instead, they are captivated by the ethos of struggle, without romanticizing it. Many reenactors avidly read memoirs and other historical sources, and know very well that these were often people who were very afraid. There is a lot of humanity evident in their experiences, and reenactors want to get a sense of what it might have been like to actually be facing such challenging situations.

There are some theories – posited by Wojciech Burszta, for instance – suggesting that historical reenactments might reflect a certain longing for war as a kind of childhood play. I approach this view with caution. There certainly is a strong significant element of play in reenactments; these events are about having fun, but that enjoyment is not as shallow as it might seem. They offer a chance to engage with experiences far removed from everyday life. Reenactors can't fully replicate the experiences of wartime soldiers or medics, but they do strive to imagine and understand what those people must have gone through.

Many reenactors get tangled in the trap of modern-day historical policies. Some of the individuals in the reenactment community, particularly those focusing on World War II, do get deeply drawn into such rhetoric. These individuals tend to be most visible and vocal in the public domain, but this doesn't represent the whole spectrum of the reenactment community. Anthropology helps us to gain a richer understanding of this phenomenon, to view reenactments from various angles, and to appreciate the diverse motivations of those who participate. These motivations aren't always rooted in patriotism; often, they stem from a deep-seated human curiosity to explore and empathize with different perspectives, bringing them to life in a recreated, alternate reality.

Who exactly are the reenactors?

Certainty, to be part of the reenactment community, a deep interest in history is almost a prerequisite. These are people who have a passion for specific aspects of history, like the design of weapons during a particular period or a specific campaign of World War II. A broad fascination with the past is essential for anyone deeply involved in this community.

But do these individuals really want to become someone else? There's been some discussion suggesting that historical reenactment is a form of modern escapism, an opportunity to step into another's shoes and assume a different identity. In my view, that's not

KAMILA BARANIECKA-OLSZEWSKA

Part of the WWII-era reenactment in Łabiszyn

KAMILA BARANIECKA-OLSZEWSKA

In 2019, the Łabiszyn reenactment was dedicated to the heroes of Normandy, featuring several hundred reenactors and numerous wheeled and tracked vehicles

the point at all. While reenactors do create impressions of commanders and historical figures, this isn't necessarily the most fulfilling part of the experience.

Doing so would be hard to avoid, because history dictates it, but the real value for participants lies in applying their skills in an alternative, often historical, reality. It's about testing oneself within a historical backdrop while recognizing that perfect historical accuracy isn't always achievable. Participants often share thrilling experiences from field games where they adopt the roles of soldiers or medics, focusing more on authenticity of action and skills rather than strict adherence to a scripted scenario. It's also hard to recreate the scenario of a battle exactly, and reenactors enjoy this freedom. They are not looking for a chance to become someone else, but to test themselves in different circumstances.

Reenactment attracts a diverse group of people, each with their own reasons for participating and unique approaches to both history and the art of reenactment. The extent of historical accuracy and creative liberty varies from person to person. Some may approach reenactment with a casual attitude, like in a game of paintball, where historical accuracy is of secondary importance.

How large is this community in Poland?

Piotr Kwiatkowski has attempted to gauge the scale of the historical reenactment scene in Poland, spanning from antiquity to nearly modern times. His findings suggest it's a community of several thousand, though these numbers are more estimates than concrete figures, as comprehensive studies to back them up are lacking. Furthermore, it's challenging to envision how such detailed research could be conducted. Kwiatkowski also explored how reenactments resonate with the Polish populace, discovering that nearly every adult in Poland has encountered some form of reenactment in their lives. This indicates that reenactments have a significant presence in Polish public sphere, which is a view I share. However, I must note that the reenactment scene has changed a lot in recent years. The COVID-19 pandemic, for instance, brought a significant downturn in public events, impacting reenactments as well. Additionally, the war in Ukraine has had a profound effect. Its nearness led many people to shy away from war-themed reenactments, particularly those related to World War II. As a result, the focus has shifted more towards private gatherings and the pursuit of uniforms and props. Last year there were no World War II reenactments at all, although this year they are slowly starting to return.

How are reenactment groups organized?

The reenactment movement is incredibly diverse, with members varying in their approach to both history and reenactment techniques. There are groups dedicated to various eras: from antiquity, the era of barbarians, through the early to late medieval periods, the Renaissance, and up to the world wars, extending nearly to modern times. I've even observed attempts at Neolithic reenactments, although these tend more towards playful experimentation than strict historical accuracy due to the scarcity of sources. Reenactments encompass more than just historical battles; they also delve into social customs, traditional crafts-

KAMILA BARANIECKA-OLSZEWSKA

In 2019, the Łabiszyn reenactment was dedicated to the heroes of Normandy, featuring several hundred reenactors and numerous wheeled and tracked vehicles

manship, and the recreation of historical settlements, all of which are integral parts of the experience. The movement is increasingly professionalizing, leading to greater access to authentic materials. Previously, reenactors spent considerable time searching for costumes, often using creative substitutes. Working on developing an accurate impression, including finding period-appropriate attire, still represents a significant part of a reenactor's personal time commitment. Nowadays, there are comprehensive guides to reenactment, offering detailed information on appropriate costume designs. For World War II era reenactments, numerous companies produce period-specific costumes. However, many reenactors strive to find original items that precisely match the events they are depicting. In terms of materials and props, historical accuracy is paramount. Every element on the long list of things a reenactor needs – from evening gowns and uniforms to various props – has to be consistent with the historical era being recreated. During the actual reenactment event, while not everything may be historically accurate, authenticity is always the goal. It's important to distinguish between historical truth and the authenticity of the reenactment experience, as they are two different aspects of bringing history to life.

How does the reenactment movement enhance our understanding of the present?

To me, reenactment serves as a critique of modern times, functioning through the lens of comparison. Reenactors discover values in historical periods that, they believe, if applied today, could help alleviate issues in social communication. Qualities such as courtesy, politeness, and chivalry are held in high esteem by reenactors, and many strive to embody and promote these traits in their daily lives.

There's also a prevailing sentiment within the movement that history should be viewed as a warning. The past, reenactors argue, can show us the devastating effects of problems like racism or social exclusion. This perspective might seem surprising, given that reenactments are sometimes associated with nationalist or right-wing groups. While there's some truth to this association, there's a significant portion of the community that recognizes the valuable lessons history can offer.

The hands-on nature of reenactment also highlights our deep-seated need for direct, personal interactions. Not everyone finds the sense of community they seek through online, digital communications, including younger generations. Participating in historical reenactments, which often involves travel, training, and practical exercises, emphasizes the importance of in-person interactions. Although reenactors engage in social media, their real-world activities underline the importance of face-to-face contact – something that's been particularly missed in the wake of the COVID-19 pandemic and the rise of online interactions. Reenactors are sometimes viewed by the broader society as mad eccentrics, a label they sometimes adopt themselves. However, at their core, they are passionate about history, finding both camaraderie and a sense of belonging within their community.

Interviewed by **Justyna Orłowska, PhD**

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Pulling the Strings

Exploring the vibrant world of Indian puppet theatre and its cultural impact.

Daria Dulok

Freelancer


ANIKA NOJSZEWSKA

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Fieldwork is always a significant challenge for a humanities scholar, a journey into the unknown. We search for knowledge, data, and first-hand accounts, seeking to immerse ourselves in the authenticity of local cultures and their unique realities. Often, the paths we tread lead us to unexpected places.

Let's take Paharganj, a lively tourist district in New Delhi. It's a bustling hub, alive with noise and filled with an array of shops and stalls that stay open until the late hours. Here locals and tourists mingle in cozy cafes and bars. Over spiced milk tea, amidst the thick air, they engage in casual yet culturally rich conversations. One of these locals is Jagdish Bhatt from Rajasthan, a practitioner of Kathputli puppet theater, little-known outside India.

Jagdish's home was near the Shadipur metro station in western Delhi, close to a busy thoroughfare where a colony of artists, known as the "Kathputli colony," is located. Established about 50 years ago, it's a haven for puppeteers, jugglers, dancers, musicians, and acrobats. Life here is simple and unadorned, with many just scraping by. Younger generations often decide to leave behind their family's performance-art traditions in favor of other careers. Such a decision is not easy to make in India, where professions are traditionally inherited; such a departure can have significant social consequences. Making and selling puppets as a source of income also doubles as a tourist attraction – they are sold in bazaars, souvenir shops, or directly by puppeteers on the streets.

The colony's fate began to shift in 2008 with the announcement of a revitalization project, part of a larger initiative to reduce India's slums. The aim was to enhance living standards by constructing a large complex with 2800 apartments, complete with essential infrastructure, an amphitheater, and a museum. Initially slated for completion by 2019, the revitalization project has faced delays due to legal disputes, resident protests, and the coronavirus pandemic, casting uncertainty over its finalization. Some families were moved to a temporary camp in 2014, more followed in late 2016, and the demolition of the old colony began in 2017. The artists themselves hold mixed views: while there's some degree of enthusiasm and hope, there are also critical voices and concerns over preserving their craft and the unique bond that came from living and working together in the colony. Reports suggest that in the transitional camps, the puppeteers are struggling to survive, facing reduced earnings, isolation, and poor sanitary conditions. Though the revitalization is progressing, with some 700 apartments completed, it is hard to predict when construction will be finished. Time will tell if the project's goals have been achieved: not only improving the artists' living conditions but also helping to promote Kathputli and other performance arts practiced in the colony.

The Kathputli Tradition

Originating in Rajasthan, a sprawling state in north-western India, Kathputli is a tradition that has flourished and spread its roots far and wide, especially

Puppet maker and performer Jagdish Bhatt

throughout Northern India. The term *kāṭhputlī* itself is a fusion of *kāṭh* (wood) and *putlī* (doll), translating directly to "wooden puppet."

Puppet theatre is an art form that boasts a rich heritage that can be traced back to ancient times, including mentions in the epic tale known as the *Mahabharata*. Despite this long history, the exact origins of Kathputli remain shrouded in mystery, with estimates dating back to the sixteenth or seventeenth century, and some sources suggesting an even older lineage of over a millennium. Historically, the art was patronized by Rajasthani rulers, becoming an integral part of religious festivals and ceremonies. Kathputli performances, once believed to have powers to repel demons or invoke rain, have evolved over time from ritualistic to entertainment purposes, now gracing significant events, serving educational roles, and captivating tourists.

The narratives of Kathputli performances are deeply rooted in the folk traditions of Rajasthan and beyond. Drawing from a vast repository of folktales, songs, and epic tales like the *Ramayana* and *Mahabharata*, they weave stories from Hindu and Muslim cultures alike. The most commonly played piece in their repertoire is Amar Singh Rathor (*Amar Siṁh Rāṭhauṛ*) – the tale of a seventeenth-century warrior, the descendent of a Rajasthani royal family. However, puppeteers are now also open to contemporary repertoire. In his performances, Jagdish Bhatt often depicts well-known film stories, and even draws upon European traditions (such as his adaptation of *Romeo and Juliet*). In addition to traditional songs, popular Indian film songs are also used as accompaniment – reflecting the puppeteers' adaptability to changing audience tastes.

A typical Kathputli performance, lasting about an hour, is a virtuoso demonstration of the puppet and puppeteer's skillful artistry. Audiences are treated to a range of spectacles – from head-juggling to acrobatic animal rides, and even a snake charmer's dance. The familiarity of the stories, particularly those drawn from folklore and mythology, allows for a performance style that focuses more on artistic expression than close narrative detail.

Kathputli puppeteers maintain a strong sense of self-reliance and tradition, with skills and stories passed down through generations. Performances usually involve two artists, often a married couple: a puppeteer and an accompanist. They may also be joined by a group of musicians playing traditional instruments like drums and harmonium. Staged predominantly outdoors in public spaces like squares or parks, these performances don't require elaborate setups or scenography. A simple stage suffices, crafted from a woven lounge-chair and a colorful curtain, forming a kind of makeshift tent. The puppeteer does not always remain hidden, but sometimes comes out to interact with the audience, enhancing the spectacle. In Kathputli, the story is narrated by the accompanist, with the puppeteer using a small bamboo whistle, the *bolī*, to bring the puppet's voice to life. This unique

expression, synced with the puppet's movements, creates a captivating dialogue between the puppet and its animator.

The audiences of Kathputli performances are both children and adults, so their content must be adapted to a wide audience and the humor nuanced. These shows often go beyond mere entertainment, serving as platforms to comment on social problems (poverty), interpret historical events (colonialism), and educate society (anti-tobacco campaigns). The puppet transcends its role as a storytelling device, becoming a vessel for conveying deeper thoughts and an authentic voice in exploring the complexities of human life.

Marionettes of Kathputli

The Kathputli marionette is brought to life through its strings, typically one attached to the head and torso and another to the hands. For some puppets (e.g. a dancer), an additional string might be connected to the hips. Each puppet is composed of two main parts: a wooden head and a body with arms. The intricately carved head is not just a facial representation; it often includes detailed elements of jewelry and attire, like turbans or crowns. Depending on the design, the head can be either movable or fixed. A fixed head extends into a long neck, forming the puppet's backbone and anchoring the arms. Movable heads, affixed with nails and fabric, add a layer of expressiveness to the puppet.

The torso and arms are made of various types of fabric, tightly and firmly intertwined and sewn together, so they form a rigid whole. Most Kathputli puppets do not have legs. However, the arms bend at the elbows, as they are one of the puppet's primary expressive elements. The puppet's costume is made of sequined and beaded fabric (often sari), appropriately tailored and attached to the body. Puppets depicting a female figure on one side and a male on the other are popular, as are designs where flipping the puppet around reveals a second character. Crafting a Kathputli puppet is a labor of love, often taking days to complete, with each handmade piece being one-of-a-kind.

For puppeteers, these marionettes are more than mere tools or sources of income; they hold a personal and emotional significance. Jagdish Bhatt, for instance, cherishes a dancer puppet he claims he never parts with. Others are decades old but continue to feature in his performances. The inaugural use of a puppet often involves a certain ritual, and when a puppet is retired, it is honored with a respectful disposal, typically being released into a river with a recited mantra.

Witnessing a Kathputli show, one is struck by its essence as entertainment – a masterful demonstration of the puppeteer's skill in animating the puppet through complex movements. Yet, one can't help but ponder: Is the puppet merely an instrument in the puppeteer's hands, destined only to dance as directed?

The art of animating a Kathputli puppet, challenging due to the puppet's weight and the pressure of the thin strings on the fingers, speaks volumes. The resulting performance, dependent on the puppeteer's dexterity, subtly shifts the spotlight to the puppet itself, transforming it into the true performer. It reveals its full potential, showing agency, and paradoxically emphasizing the human longing for freedom from constraints.

In the world of Kathputli, each performance is not just a display of skill but a narrative rich in tradition and human expression. ■

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Wanted: Authentic Employees

People increasingly project idealized images of themselves in today's world – those who manage to remain authentic make for highly sought-after employees.

Joanna Żukowska

Institue of Enterprise
Warsaw School of Economics (SGH)

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The modern-day world, increasingly dominated by Instagram, Facebook, Twitter, and other social media sources, encourages people to develop and project an idealized, often quite illusory, image of themselves. This aspiration to be perceived as being different (i.e. better) than one really is often applies to people working at a company. Here, however, the strategy of "wearing a mask" is very short-term. Eventually, the "bubble" will burst – sometimes even during the recruitment interview, leading mutual disappointment in its wake.

The truth

So, what can be done to avoid such a situation? The answer lies in *authenticity*. Employers increasingly emphasize that this is one of the most desired traits in both current and potential employees, recognizing that it usually goes hand-in-hand with high-quality productivity. An employee is seen as authentic if there is a certain consistency between their actions, behaviors, and internal convictions. Authentic employees not only manifest their inner values and beliefs at work, but also act in accordance with who they truly are, without hiding their weaknesses. They are characterized by honesty, openness, and sensitivity. They take responsibility for their actions, including their positive as well as negative outcomes. They can own up to their own mistakes, treating them as valuable lessons for the future. They do not seek to blame others, but consider what steps to take to avoid future problems. In other words, they handle failures constructively. An authentic employee is usually more committed and derives greater satisfaction from their work. This translates into a sense of happiness and better maintenance of work-life balance. It also increases the sense of psychological security.

An authentic employee is someone aware of his or her competencies as well as the things he or she needs to improve upon, and therefore enthusiastically

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strives to pursue personal and professional development (Table 1).

Note that most employees themselves also value authenticity. It allows them to exercise greater autonomy, and consequently – to better perform their professional duties, take initiatives, and take innovative approaches.

Employees who are frank and honest with themselves usually have a better understanding of their own competency matrix (as laid forth, for instance, in the "Johari window"). This allows them to work better, be more independent, control their emotions, and smoothly accomplish tasks. This, in turn, earns them a better position within the company. The above-mentioned psychological security makes authentic employees more willing to share their observations and ideas. They speak honestly, inspire trust, and build relationships within the team. They therefore develop closer relationships with their coworkers, which translates into increased team productivity. Moreover, teams in which a certain natural synergy can be observed operate more freely, their members are calmer and more composed, which translates into a better capacity to handle urgent and difficult tasks.

Note that employees described as "authentic" typically point out several factors that a company should provide to increase the authenticity of team members: including flexibility in work methods, individualized dress styles, and a cozy workplace atmosphere.

Encouragement

It is, therefore, possible to influence the level of authenticity among a staff of employees. One particularly helpful approach is known as *coaching*.

Coaching is a process of supported development, based on a mutual relationship between a coach and an employee (the "coachee"). The coach helps the employee identify and achieve their goals, as well as discover their own potential. The coaching process encourages the employee to communicate openly, to answer difficult questions that foster reflection and change. Through this, the employee better understands the mechanisms of their own action mechanisms and what determines them (Table 2).

In summary, coaching can have a significant impact on employee authenticity. By strengthening self-awareness of both personal values and profes-

TABLE 1 **Benefits of Authenticity in the Workplace**

Benefits	**Characteristics**
Higher quality of work	Authentic employees are more committed to their tasks, which translates to higher-quality work.
Greater creativity	Accepting their own strengths and weaknesses allows employees to approach problem-solving more creatively.
Better team relationships	Honesty and authenticity in communication foster trust and better relationships among team members.
Greater satisfaction	Authentic employees experience greater job satisfaction, as they identify with the tasks and results achieved.
Better self-esteem	Awareness of being authentic translates to a positive self-view.
Greater ability to cope with stress	Being true to oneself helps in coping with challenges and pressure at work.
High motivation for self-improvement	Authenticity creates conditions for a better understanding of one's goals and striving to attain them.

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TABLE 2 **Impact of Coaching on Employee Authenticity**

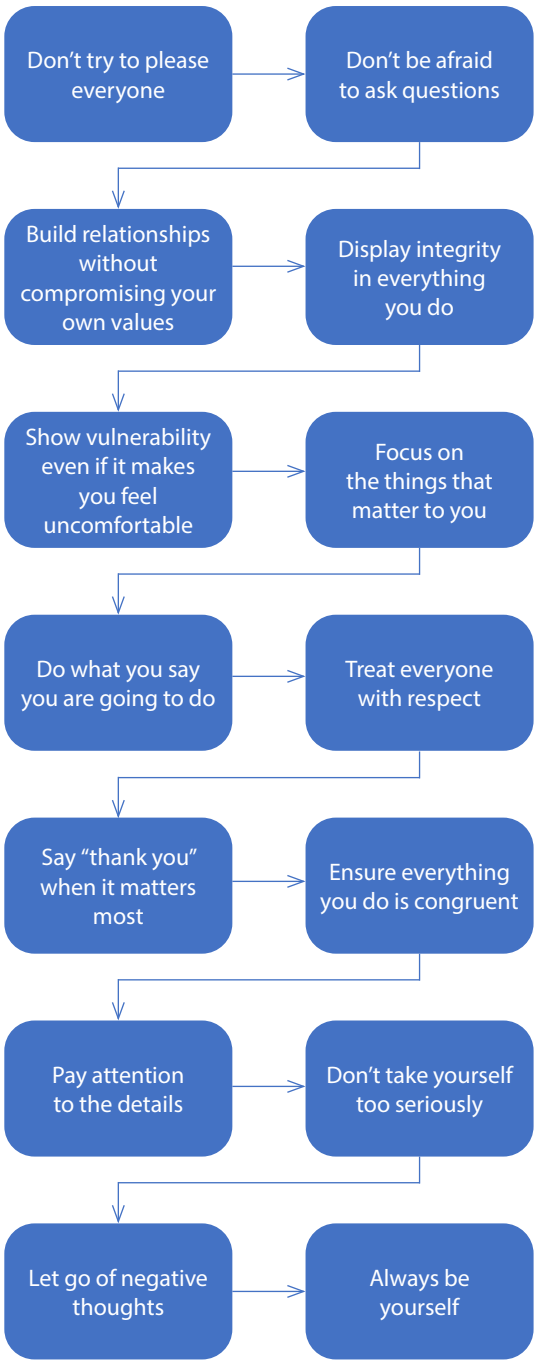
Action	Type of Impact
Understanding the employee's values and goals	By asking appropriate questions (including Cartesian ones), the coach helps the employee identify key areas of action and motivators. This knowledge allows for authentic decision-making and functioning in line with recognized values.
Identifying the employee's strengths and weaknesses	Knowing or confirming one's own strengths and weaknesses allows for the best, more authentic choice of directions to seek development, in line with one's capabilities.
Strengthening self-confidence and trust	Increased belief in one's own capabilities due to the coaching process enables the employee to take on more responsible tasks and ambitious challenges. It also contributes to easier collaboration with others.
Improving communication skills	Through coaching, the employee develops better skills at listening and asking questions, which translates into greater openness and better understanding of others.
Managing own stress and coping with pressure	Skills developed in the coaching process, for handling difficult situations and using stress reduction tools, ensure that the employee will react to challenging situations and obstacles in an authentic and calmer manner.
Increasing emotional self-awareness	Better self-understanding and emotion control translates into responsible, mature, and authentic relationship-building with others.

sional goals, coaching contributes to fostering an authentic attitude. Therefore, investing in the coaching process can be a beneficial solution for a company.

Alongside coaching, *mentoring* is another approach that can positively influence employee authenticity. The mentoring process involves a mentor, with extensive organizational experience, and a "mentee." The mentor shares stories of situations exhibiting good practices and also situations that did not end so well, thereby exhibiting and exemplifying authenticity. This helps the mentee to better handle their own professional challenges, to recognize the importance of being authentic and its benefits, both for themselves and for the company.

In summary, the flowchart on the right lists a variety of steps for maintaining maintain greater authenticity in the workplace. ■

Guidelines for being authentic in the workplace



Further reading:

"17 Examples of Authenticity" opexmanagers.com/examples-of-authenticity/

"Why Is Authenticity at Work so Hard? 5 Ways to be More Authentic" https://www.betterup.com/blog/authenticity-at-work

Reis G.G., Braga B.M., Trullen J., Workplace authenticity as an attribute of employer attractiveness, *Personal Review* 2017.

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Preserved Stories

SYLWIA FABISIAK-CHOJNACKA

Michał Świerzbiński's diary, describing his administrative work as Polish Consul in Daugavpils from 1923 to 1937

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The PAS Archives in Warsaw hold numerous diaries, journals, and memoirs, standing as testaments to the power of personal narratives in history. They offer unique insights into historical events as experienced by individuals, supplementing official documents.

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Sylwia Fabisiak-Chojnacka

PAS Archives in Warsaw

Archives are a type of institution established to collect, preserve, and provide access to documents. A "document," in turn, is by definition, any text, photograph, or other item that holds evidential or informational value. Archives therefore are a place of contact with truth, credibility, and historical accuracy. At the PAS Archives in Warsaw, we safeguard the intellectual legacies of more than 600 scholars, each contributing a small piece of history. Among these legacies, a prevalent type of document includes diaries, journals, and memoirs.

Within these pages, authors often recount ordinary occurrences from their daily lives. For instance, Maria Gąsowska, a boarding-school girl, jotted down in 1881: "In the morning, I wandered aimlessly from corner to corner, then spent some time in the garden. In the afternoon, a group of people went to the shooting range, so I watched from the window." Diaries frequently highlight easily verifiable events, offering concise reflections. Authors capture how their lives intertwined with the fate of their country or how the nation's destiny influenced their own. Often, the urge to keep such records is tied to the extraordinary historical periods in which they lived. For instance, the Polish politician Władysław Leopold Jaworski's diary entries shed light on his role chairing the Supreme National Committee and discuss Polish affairs in Europe during WWI. Aside from his own notes, his diary preserves numerous attachments, including extensive correspondence with such notable historical figures as Józef Piłsudski and Władysław Sikorski, as well as materials sent to the Supreme National Committee. Diaries of this sort are invaluable sources for historical research.

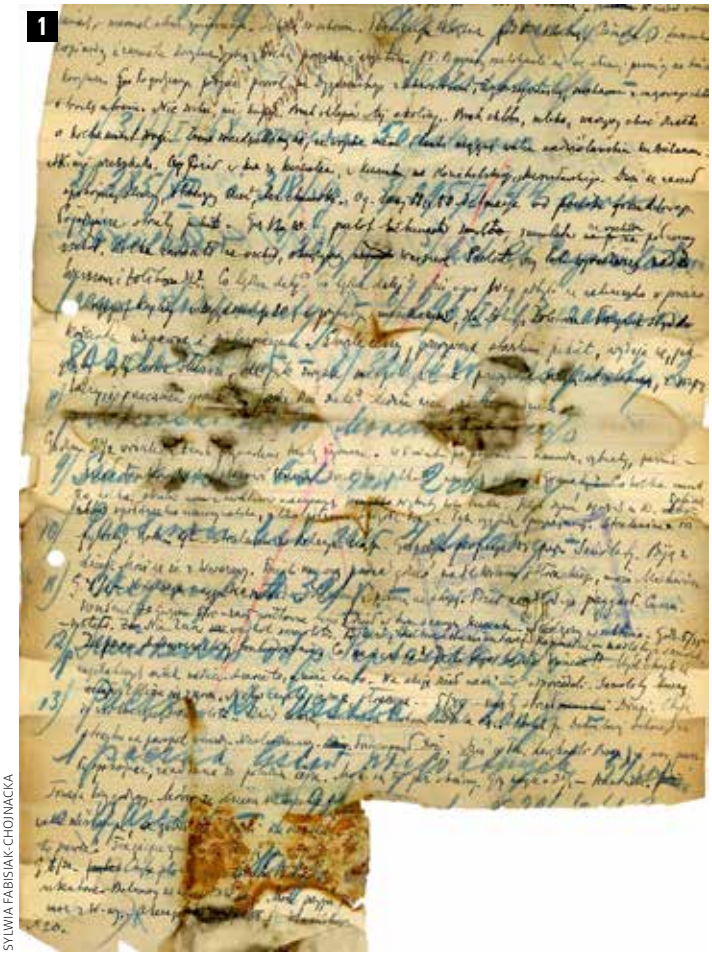
SYLWIA FABISIAK-CHOJNACKA

The diary of the politician Władysław Leopold Jaworski

Michał Świerzbiński, serving as Consul of the Republic of Poland in Daugavpils, Latvia, notes in the introduction to his diary covering his official work from 1923 to 1937: "Based on archival documents and the achievements of historical research, I will have to 'debunk' many established views about our past. (...) For understandable reasons, I will not be able to disclose everything publicly, and so such material will remain in this diary."

Another interwar politician, Artur Śliwiński, planned to write a memoir, but it was his wife Leokadia who took on the task. As she explained in the preface: "We lived through our long life at the turn of two eras. We witnessed profound upheavals and transformations, terror-instilling cataclysms difficult for the mind to grasp. In the swiftly moving course of events, Artur Śliwiński always played a vibrant, often prominent role. Many times, I asked him to immortalize his experiences, to leave behind his testimony (...) he never had time for that..."

Diaries kept by teachers and educational activists described the efforts to build a Polish education system after the years of foreign partition. The teacher Maria Smulikowska – the wife of Julian Smulikowski, an educational activist, a member of parliament,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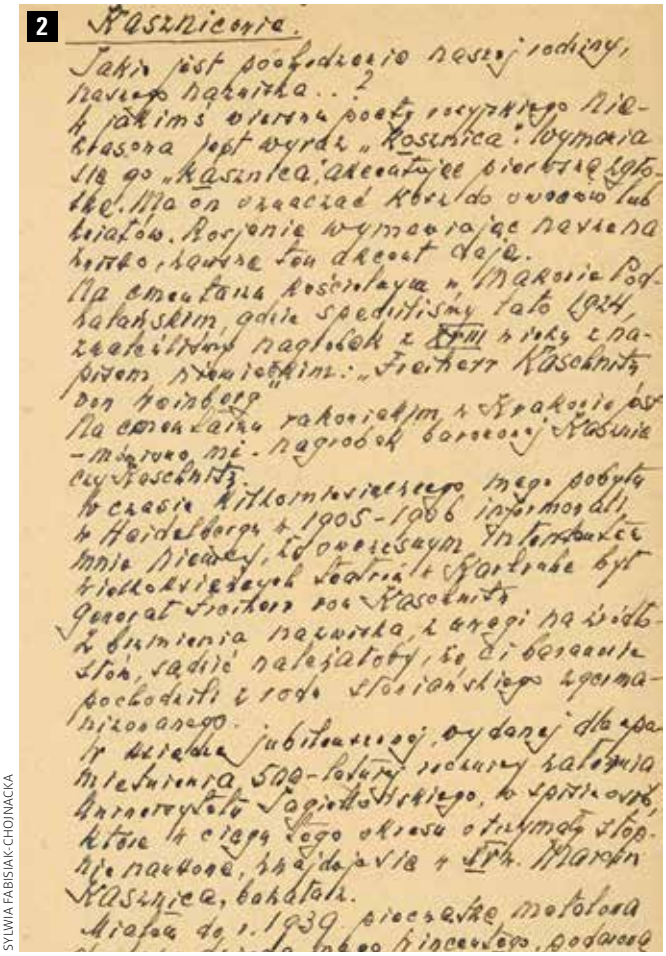
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and vice president of the Polish Teachers' Union – left two brief memoirs: "For 30 years, I was witness to my husband Julian Smulikowski's life and creative work, full of exertion and joyful enthusiasm, and I want to dedicate my memories to him. Enthralled by the greatness of my husband's ideas and radiant fervor, I collaborated with him and participated in many of his undertakings despite my professional and family duties."

Detailed Accounts

Some diaries describe family stories or exceptional events. These accounts are immensely diverse, but much space is devoted to WWII and the Warsaw Uprising. Such writings are highly valuable because they are often the only sources depicting the effects of wartime operations and the sentiments prevailing among the civilian population.

Piotr Bańkowski, the longtime editor of the archival journal *Archeion*, described his experiences at the Sokolnicki Fort in Żoliborz during the Warsaw Uprising. A whole collection of archives and books had been deposited there for safekeeping during WWII, which he strove hard to protect both from bombing raids and from people also hiding out in the fort. Tadeusz Makowiecki, the curator of the University Library in Warsaw, recounted his efforts to rescue and safeguard the library collections he oversaw throughout the war, including after the fall of the Warsaw Uprising. To save the library, part of it was hidden and bricked up, securing it from destruction or being taken away as war loot.

The historian Prof. Włodzimierz Dzwonkowski chronicled – virtually day-by-day – the times of the Warsaw Uprising, being evacuated and liberated, the rebuilding of postwar academic life. In the preface to his journal, he notes: "I write this diary/memoir fresh from the events, mindful of how rarely there are direct eyewitness accounts of great historical moments." The Warsaw Uprising found him in the Wola district, from where he and his family made their way to the Old Town, surviving there until being expelled from the city. His historical awareness prompted him to bear witness to the truth of what he had seen.

Some diarists intended their memoirs to be read by others – while writing they addressed the readers directly, repeatedly offering reassurances that their descriptions indeed authentic. Józef Staszewski, a geographer and cartographer, described his time

Fig. 1
Piotr Bańkowski, longtime editor of the archival journal Archeion, described his experiences in the Sokolnicki Fort in Zoliborz during the Warsaw Uprising

Fig. 2
Stanislaw Kasznica, a senator and two-time rector of the University of Poznan, kept a diary from 1890, and for some time also memoirs

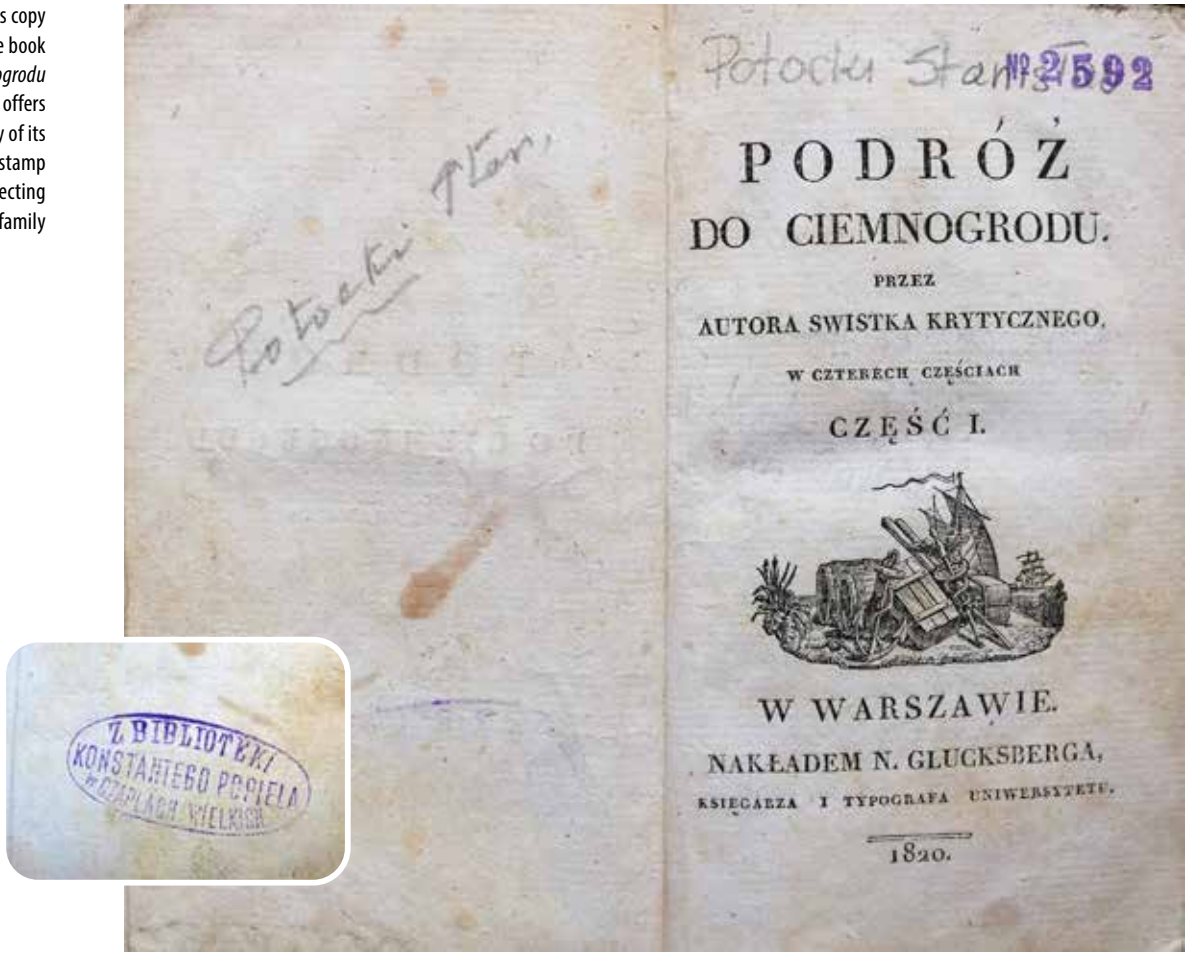
in a prison in Lwów: "Gestapo prison, August 1943 (...). Condemned to a cruel, slavish death, we had no illusions. (...) Suddenly, Zuckerkandel looked at me and said: 'Professor, you're lucky, you will live.' That authentically happened. It was an inconceivable prospect. And yet I came out whole and healthy.'

The family of the prominent lawyer Prof. Stanisław Kasznica left behind an interesting source. The author himself, a senator and two-time rector of the University of Poznań, kept a diary since 1890 and also, for a time, a memoir. Towards the end of his life, he wrote an autobiographical book, *Ród*, chronicling his family lineage. In it, he described the lives of his ancestors, all the way up to his contemporary times. Using a legalistic style and strictly adhering to the chronology of events, he depicted private life events, like the death of his first wife, alongside national and state affairs: "In spring 1921, Amelcia fell ill; we fought (...) fiercely for her life. She passed away on December 13, 1921. The Versailles Peace Congress authorized the Council of Ambassadors of the Main and Allied Powers to determine our southeastern state border." His second wife, Eleonora, also left behind a diary, describing the births of their children and details of ordinary life under the care and shadow of a much older husband. The overall picture is further complemented by the memoirs of their daughter, also Eleonora, portraying the warm atmosphere of life, multi-generational family, everyday life organized by her mother, and respect for her hard-working father. Their mutually intertwining relationships provide a splendid and authentic picture of the life of a professorial family in the interwar period.

Some of the memoirs preserved at our archives have been published with scholarly commentary. Publishers are not always interested in the entire memoirs, which often contain highly varied information (e.g., about books the author read, or thoughts difficult for modern-day readers to accept). In such cases, although a selection is published, the entirety remains available at the archives.

Intertwined Fates

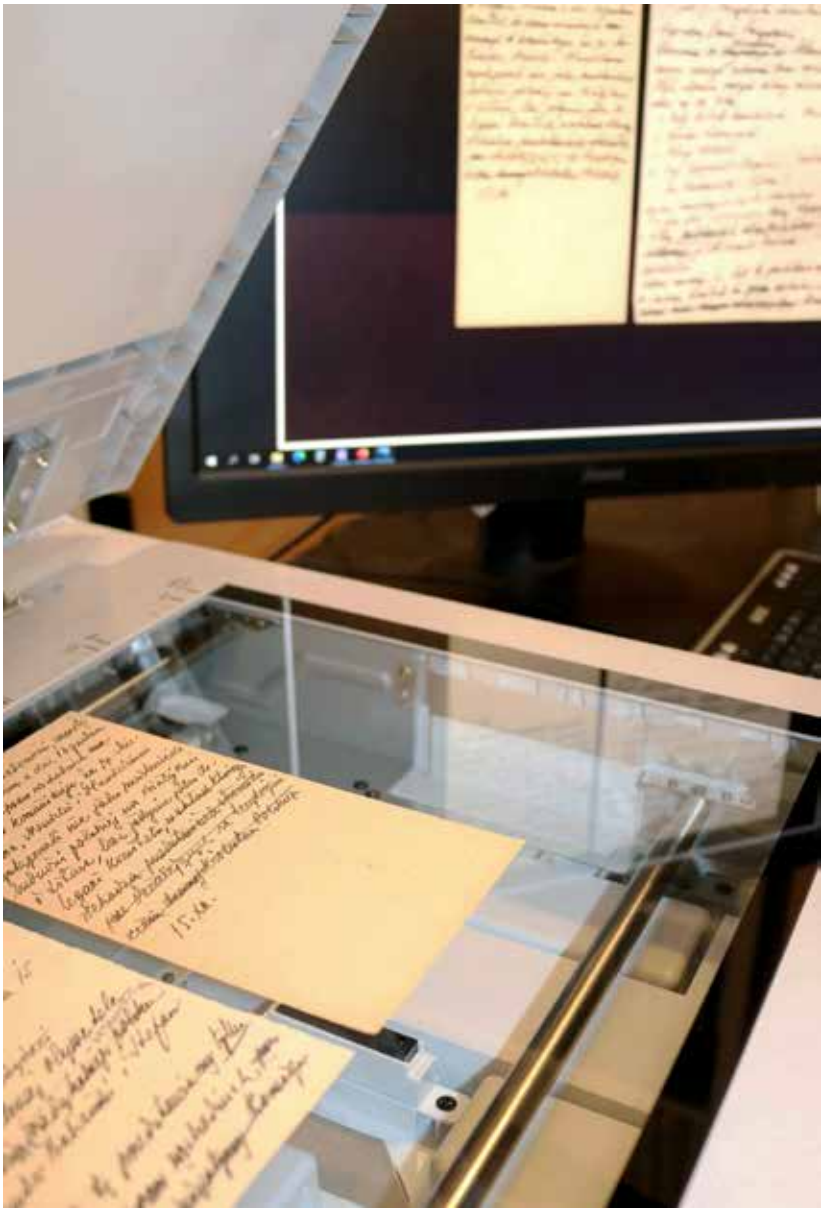
Books once held in private libraries were often marked with owners' signatures, bookplates, or library stamps placed on the first pages and inside the text. These markings turn a book from just one of multiple published copies into a distinctive, authentic item, part of a specific collection – offering clues about the fas-



The title page of this copy of the book *Podróż do Ciemnogrodu* [Journey to Darktown] offers evidence of the history of its owners, including the stamp of the book-collecting Popiel family

cinating lives of their successive owners. The provenance of a book can often be traced by examining ownership markings.

For instance, the PAS Archives holds an intriguing copy of *Podróż do Ciemnogrodu* [Journey to Darktown] – a novel/treatise written by Stanisław Kostka Potocki, published in 1820. The author depicts a fanatical, religiously intense state where ignorance runs rampant. This particular copy is stamped, indicating that it belonged to the private book collection of Konstanty Popiel from Czaple Wielkie near Miechów (in the Kielce region). This fact is part of a much broader story: the village of Czaple Wielkie had been owned by the Popiel family since 1749, when Maria Piegłowska brought it as a dowry to her husband Konstanty Popiel. The next heir was Konstanty Michał Ignacy Popiel of the Sulima coat of arms (1774–1847), followed by his grandson Konstanty Popiel of the Sulima coat of arms (1841–1919). Irrespective of the family's financial condition, successive heirs of the estate continued to collect books. In preserved documents, other family members described library-building as one of their passions. For instance, Wincenty Popiel (born 1825), an independence activist and Archbishop, collected books in Czaple Wielkie and wherever else he resided. He possessed a library in Płock as a bishop and in Novgorod as an exile. His mother collected prayer books; their extensive correspondence mentions book exchanges between the son and mother. As per a notarial record, the book collection remained with Archbishop Popiel until his death and was then taken over by Konstanty Popiel. The book collection was gradually supplemented by donations from family members. However, after many years, the library at the Czaple Wielkie manor was dispersed; some books ended up in the antiquarian market, and through this route, a part of the collection found its way to the Library of the PAS Archives in Warsaw. Another part is now held in the Gdańsk Library of the PAS – including is an inventory of old prints from Konstanty Popiel's library.



SYLWIA FABISIAK-CHOJNACKA

Part of the process of digitizing archival materials

Digital preservation

The digitization of archival materials has become an integral part of the work of libraries and archives. Authenticity is a key aspect that must be considered when preserving archival materials. This is accomplished via the principle of maintaining the integrity, truthfulness, and reliability of digitally preserved documents. *Integrity* involves preserving the completeness and consistency of archival materials. All elements of the original, such as text, images, seals, and other individual contents, e.g., marginalia, should be preserved in the digital version without any external interference. The format, resolution, and coloring should be replicated. When this is done with proper care, archival materials can properly serve their function as scientific and historical sources. *Truthfulness* refers to preserving the original meaning and content of materials. Making changes to a text or interpreting it in a way contrary to the authors' intentions is unacceptable. *Reliability*, in turn, is related to ensuring that the digital version is an accurate representation of the original, so that users of the materials can be confident that they have access to credible sources.

Lastly, another important aspect is access control. To preserve the best possible condition of original documents, archive institutions are generally shifting away from providing access to originals in favor of access to digital copies. However, controlled access to digitally preserved materials is also necessary to safeguard their authenticity and avoid improper manipulation. ■

1

C. LAUDEREAU

Photo 1
New Caledonia. The endemic *Megastylis gigas*, one of the most common orchid species found on the island

Vanilla and Other Wonders of Nature

Orchids are masterpieces of evolutionary success and aesthetic splendor.

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Prof. Dariusz L. Szlachetko

Dean of the Faculty of Biology at the University of Gdańsk, specializes in the study of orchids. He has carried out dozens of expeditions and examined specimens in herbariums around the world. His field research has taken him to French Guiana, Peru, Ecuador, Colombia, Cameroon, Madagascar, Vietnam, and New Caledonia. He is the author or co-author of 3888 new taxa of various ranks and new nomenclatural combinations in the Orchidaceae family.

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Photo 2
New Caledonia, 2019.
A misty mountain forest

Dariusz L. Szlachetko

Faculty of Biology, University of Gdańsk

Plants in the family Orchidaceae have undoubtedly achieved the greatest evolutionary success among all types of plants pollinated by animals. Representatives of this cosmopolitan family can be found on all the continents except Antarctica, and in all types of habitats except deserts (they avoid extremely dry areas). Adaptation to various groups of animals as pollinators and to different environmental conditions has led orchids to become a highly diverse group of plants in almost every aspect. Unlike other flowering plants, orchids do not undergo double fertilization, a characteristic process for angiosperms. Some 90% of all orchid species are epiphytes, meaning that they grow with their roots attached to another plant. Orchids have many features adaptive to this lifestyle. For example, the roots of epiphytic orchids are surrounded by a layer of dead cells, called velamen, which can quickly absorb water, either from rainfall or in the form of water vapor.

Orchids are a group of plants that displays a range of extremes – ranging from very small plants to true giants. Orchids are perennial plants, but there are certain species whose lower stem may become woody, such as *Clematepistephium smilacifolium* from New Caledonia. Orchid plants vary greatly in terms of size, from just a few millimeters to even 100 meters in length. The largest orchid is vanilla, a climbing plant with fleshy stems and leaves. The longest measured vanilla specimen was about 100 meters long, although

T. KUSIBAB (2)

Photo 3
Ecuador, 2008. Cordillera del Cóndor. In the tropics, botanizing sometimes requires unconventional skills

Photo 4
Ecuador, 2008. Cordillera del Cóndor. It's hard to believe this is almost on the equator. The weather in the páramo zone can be brutally cold, but there are plenty of orchids

Photo 5
Peru, 2008. Orchids can be found growing even among the ruins of Machu Picchu – *Brasolia dichotoma*

the plants can undoubtedly grow even larger. Vanilla is a monopodial plant, theoretically capable of unlimited growth. Among the sympodial orchids, the tallest is *Brasolia (Sobralia) altissima* from the Peruvian Andes, which resembles bamboo and reaches almost 15 meters in height. The largest epiphytic orchid is *Grammatophyllum speciosum* from Borneo, which can form pseudobulbs up to 7 meters long. Certain orchids have inflorescences so tiny they can fit on the head of a pin, such as *Platystele imperialis* from Guatemala.

Unique and intriguing flowers

Orchid flowers are also highly varied. Based on the kinds of orchids that are familiar to us from flower shops, greenhouses, or botanical gardens, we might think that they always have beautiful, very attractive flowers. However, most species found in nature have flowers that are quite inconspicuous at first glance. Only when observing them through a magnifying glass can one notice their unique and intriguing structure. Given the extent of the variation, it is worth asking what common feature this group of plants shares, what distinguishes them from others.

Let's start with the reproductive organs. In the case of orchids, the stamen fuses with the pistil neck, forming a kind of rod, called the *gynostemium* or *column*. This is a unique structure found in this form only in orchids. The pollen mass in most orchids is compact and forms a pollinium. The stigma of the flower also undergoes various modifications. The central part of the stigma transforms into a rostellum, which is infertile and loses its primary functions. This structure forms various appendages for attaching the pollinium to a pollinator. Another feature of orchids is the transformation of the central inner petal into a labellum, which is larger and differently colored and shaped, often with protrusions. It serves as a kind of landing platform for insects. Some orchids have a spur at the base of the labellum, where nectar is stored. There are certain orchids whose labella mimic the females of particular insect species. *Paphiopedilum sanderianum* from Borneo, with inner petals of the perianth up to a meter long, is one of the most spectacular. Interestingly, this species was described in the late nineteenth century. For almost 100 years it was known only from a single herbarium specimen. It was even thought to be a chimera, not found in nature. It was not until the 1970s that the plant was rediscovered in Borneo.

Orchid seeds typically consist of a few dozen undifferentiated cells surrounded by a seed coat much

B. SZMIT

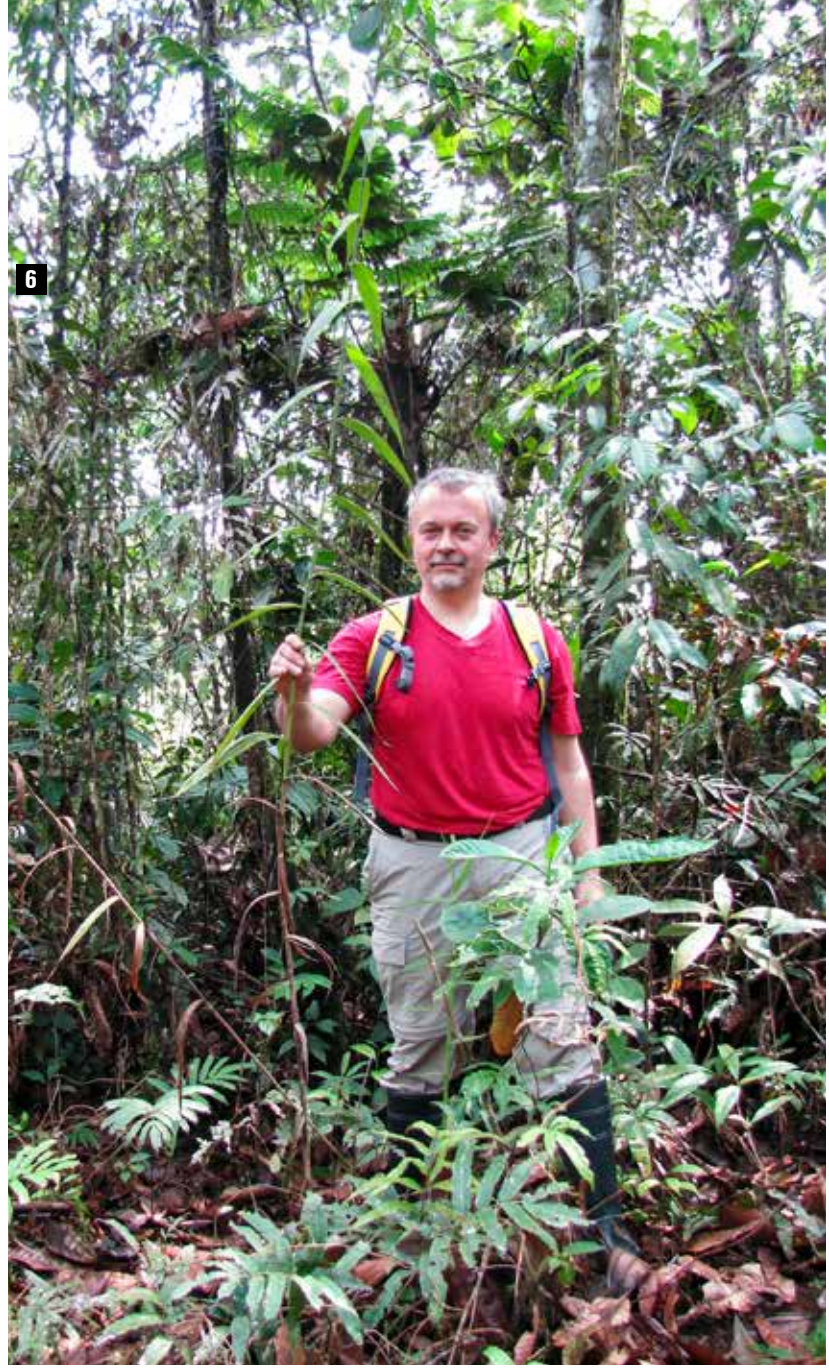
larger than the embryo itself, creating an air chamber. As a result, the seeds are very light, dust-like, and can weigh mere millionths of a gram. There can be up to several thousand seeds in a single fruit, which are very easily carried by the wind due to their small size. However, these lightweight seeds are not equipped with reserve nutrients and so require specific fungi, mainly of the genus *Rhizoctonia*, to be able to germinate. Of the vast number of seeds produced by orchids, only a few percent have the ability to germinate after interacting with the right symbiotic fungi. Moreover, the development of the young plant itself is very slow. For the first few years, the plant functions as a group of undifferentiated cells, called a *protocorm*. The entire developmental cycle from seed germination to flowering can take years, even a decade or two. Vanilla is an exception, with fleshy, berry-type fruits that contain substances harnessed in the food industry.

Victims of their own success

Nearly 30,000 species of orchids have been described worldwide. The country with the greatest number is Colombia, home to about 5,000 species. This is even more striking when compared to Poland, where the total count of *all* vascular plant species is about 3,000. South America, especially the Andean countries, is generally a hotspot for orchid diversity. Most of the species groups there are young, still evolving quite rapidly. Nearly every mountain valley and peak has a unique array of species not found elsewhere. Also very rich and diverse are Australasia, Africa, and islands like Madagascar, New Guinea, and New Caledonia, where we can find a great wealth of endemic species. The temperate zone, however, is not particularly preferred by orchids. Poland has about 50 species, mainly in the south. In the Tatra Mountains, for example, we may encounter several species growing along hiking trails, but there are far fewer in the central part of the country.

Orchids are, in a sense, victims of their evolutionary success. They are largely dependent on insects and on mycorrhizal fungi. If the right organisms are not present, seed production and subsequent germination are not possible, causing populations lacking pollinators or symbiotic fungi to die out. Climate change is taking its toll on quite a few organisms, and orchids are certainly no exception. High temperatures, droughts, fires, and floods are major threats. Another danger faced by orchids is the extermination of their pollinators. If the insects are unable to overwinter in rotting stumps, for example, they will die, reducing the availability of potential pollinators.

Locally, orchids can be very common. However, all orchid species are protected and on the CITES list, so they cannot be plucked or transported across the borders of countries where they occur naturally. One can even go to jail for illegally transporting orchids, and many places have banned the trade of orchids without special permits. Unfortunately, despite this, illegal trading in orchids obtained from the wild is still practiced today. Individual plants can sometimes fetch dizzying prices (up to several thousand euros) simply because they were collected from the wild. This is astonishing, given that most species can be purchased for much lower prices from specialized nurseries where they are reproduced *in vitro*. This is especially true for valuable and rare species, whose wild populations only consist of a few dozen specimens. For instance, orchids of the rare genus *Paphiopedilum*, which are available at specialized nurseries and can easily be purchased. Species such as *Paphiopedilum kolopakingii* are particularly sought after, as they form inflorescences up to two meters tall, boasting up to 14 impressive flowers. Preserving them in the wild and protecting their natural sites must be a priority. Orchids are, after all, true wonders of nature. ■



J.C. URIBE

Photo 6
Colombia, 2010.
The road to Buenaventura.
The author with
a *Selenipedium aequinoctiale*
specimen, one of the rarest
species of the genus

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Authenticity as a Task

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Do you often find yourself saying that you *had* to do something? In making decisions, do you metaphorically let go of the steering wheel, leaving things up to fate, providence, or destiny? Have you ever acted not because you consciously chose to, but rather because you followed the crowd, simply wanted to fit in, or took shortcuts? Have you, after navigating endless twists and dead-ends in the labyrinth of life's choices, willingly given up your freedom, submitting to whatever principles, ideologies, or people seemed most convincing at the moment?

If you answered "yes" to even one of these questions, it means you understand what losing authenticity means in the deepest existential sense. This occurs precisely when we start to deny the truth of our own liberty, trying to fool the world and ourselves that we

A Thousand Years of Solitude by Natasha Mirak, oil on canvas, schlagmetal, 2023

HTTP://NATASZAMIRAK.PL/

HTTP://NATASZAMIRAK.PL/

Here and Now
by Natasza Mirak,
oil on canvas, 2023

quite simply *have* to do something. Yet, the truth is that in most situations in life, it's easier to have to do something than to be at liberty to do something. Sound paradoxical? Let me explain.

In the philosophy of existence, sometimes also called *existentialism*, freedom is one of the most important concepts for any meaningful description of human existence. However, it immediately becomes wrapped up in a dispute, or perhaps we should say, in a certain tension with necessity – into which existence is inherently woven, as it inevitably faces temporal limitations. In other words, humans are subject to necessity as mortal beings, and death is the ultimate point of reference, regardless of human will. Here we can mention Kant's concept of reconciling two different orders within the rational subject: the freedom of intellect and the necessity of nature, entailing constant tension between choice (what can be chosen) and law (especially moral law). However, I do not wish to stray too far from the solutions proposed by existential philosophers, whose way of describing freedom is closely linked to the conocept of authenticity.

In his introduction to the compilation volume *Filozofia egyzetencjalna* [Existential Philosophy], the prominent Polish philosopher Leszek Kołakowski wrote: "Saying 'I am my own freedom' does not mean that we have reasons to find in the empirically considered psychological human subject any mysterious gaps or margins escaping the law" (1965, 17) Freedom here is not synonymous with anomie or arbitrariness. It is not about breaking rules, nor is it a notion in the realm of psychology – a subjective, psychological feeling of freedom. It is, instead, "the inalienable situation of being, constituted by this very turning towards oneself" (19).

Authenticity, in this sense, would be self-reference, a continuous movement of searching within oneself for the basis of all actions and decisions. The awareness of death is key here and it cannot be fabricated – neither in its finality, nor in its terror. We have no escape from the intrinsically contradictory situation, where the only invariable element of life itself is life's very antithesis. This places humans in a constant ambivalence, combining radical dissent and humble acceptance. According to Søren Kierkegaard, the reason we lapse into inauthenticity is the fear of death, which leads us to make mostly futile attempts to impose the order of the divine, transcendent infinity into individual, human finitude. Such attempts are doomed to fail, carrying with them the absurdity characteristic of religion, which can only be accepted on condition that the subject manages to transcend its limitations and make a leap into faith. However, this requires the suspension, or perhaps even, as frightening as it sounds, the rejection of ethics. Authentic religious existence, being a gift and a challenge, is above all a grace and none of the purposive structures of rationality apply to it.

Champions of faith, however, are not often encountered. More often, we encounter people who squander their relationship with themselves by falsifying their existence. This is because we fear infinity, the abyss into which no one likes to peer. According to Kierkegaard or Jaspers, God exists in eternity, and transcendence is what makes it possible to overcome the absurdity of existence. But for Jean-Paul Sartre, the very assumption of the possibility of an immortal soul is inauthentic. Such an assumption is enough to nullify our here-and-now, to lift the burden from our freedom, which, apart from its positive aspect, manifested as "freedom to," also has its negative aspect, i.e., "freedom from." Moreover, the reverse of freedom is responsibility, which in the immediacy of experience (also moral) is not really lifted from us by any higher power. In this context, authenticity would be the virtue of realizing the possibility of making unconditioned choices.

You don't *have* to do anything, there is no fate, no reason – you are you. And no one is better than you at finding your way in this labyrinth. ■

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Raised From Ruins

PHOTOGRAPHY BY MARCIN KMIECIŃSKI

The restored Royal Castle in Warsaw includes original decorative pieces that link it back to its illustrious past from before WWII

Photo 1
Aerial photograph of the ruins of the Old Town and Royal Castle in Warsaw, 1945

The Royal Castle in Warsaw, a historic symbol of Polish heritage and pride, endured very serious devastation during World War II. This architectural jewel, once a residence of Polish kings and the site of significant national events, lay in ruins following the systematic destruction by German forces. The castle's fate after the war became a subject of national debate, reflecting the broader struggle of the Polish people to preserve their cultural identity amidst political upheavals.

Several decades after the war, on 19 January 1971, the communist authorities made a historic decision to restore the palace. This marked the beginning of a monumental effort, led by the Citizens' Committee for the Reconstruction of the Royal Castle (OKOZK). The restoration team, under Prof. Jan Bogusławski, faced a mammoth task: to bring the Castle back to its pre-1939 glory, to reinsert all the surviving relics in their original places, and meticulously recreate all the lost portions based on historical records.

The most valuable point of departure for faithfully reconstructing the castle, especially its interiors, were the art objects saved in 1939 (246 paintings – including all works by Canaletto and Bacciarelli, four royal thrones, 40 pieces of furniture, seven textiles, numerous historical memorabilia and decorative artworks), fragments of architectural details and furnishing elements (paneling, doors, cornices, overdoors, fireplaces, fittings), and about 4,000 details recovered from the castle ruins just after the war. All original elements were conserved, and their locations in the old interiors determined based on iconographic materials. Although in qualitative terms the preserved elements constituted no more than about 10–15% of the overall interiors, they allowed for approximately 75% of the detailing of individual rooms' interiors and furnishings to be faithfully resolved.

After years of painstaking work, the Castle's reconstruction was officially completed in August 1984 and its doors were opened to the public.

Today's visitors to the Royal Castle in Warsaw will easily notice certain darker-shaded elements in the interiors – these are the original pieces, as intended by the designers. As Prof. Aleksander Gieysztor, the castle's first director, used to say – the originals that returned to their former places during the reconstruction are like a thin thread linking the old, prewar castle with the reconstructed one. The reconstruction of Warsaw's broader Old Town district, along with the Royal Castle, was recognized by UNESCO as an example of exceptional reverence in restoring this aincent city methodically destroyed by the Germans.

Bożena Radzio
Curator, Royal Castle in Warsaw

Photo 2
Ruins of the Royal Castle in Warsaw, 1945

Photo 3
Great Hall, original doors with standards

Photo 4
Great Hall, medallion with a portrait of King Stanisław August Poniatowski by André Le Brun, preserved in September 1939

Photo 5
Great Hall, marble statue of Apollo by André Le Brun, 1778

Photo 6
Marble Room, portraits of Polish kings by Marcello Bacciarelli

Photo 7
Throne Room, fireplace assembled from elements rescued during the war

Photo 8
Throne Room, throne chair by Johann Christian Kamsetzer against a backdrop reconstructed based on the original eagle found in the United States in 1991

Photo 9
Knights' Hall, overdoor with a portrait of Krzysztof Radziwiłł by Marcello Bacciarelli

Photos 10, 11
Conference Room with original fragments of mural decoration by Jan Bogumił Plersch, 1783

Photo 12
Green Room, with a bust of Voltaire by Jean-Antoine Houdon dating from 1778 visible in the corner

Revolutionizing Education: CampusAI

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Aureliusz Górski
Founder & CEO of CampusAI in Warsaw

During the COVID-19 pandemic, the traditional spaces for working and learning were all suddenly shut down. This unexpected situation served as a catalyst, encouraging the creation of similar spaces situated in the virtual world. Our project – CampusAI – involved creating the graphical representation of a physical space, in the form of an interface in a video conferencing system – a "digital twin." The prototype drew together several hundred people and resulted in several hundred events. Polish innovators rallied around this project, giving rise to the Venture Café platform.

A significant milestone in the development of CampusAI came with the implementation of a state-of-the-art conversational model in the form of a chatbot (ChatGPT). CampusAI has become a virtual school, where anyone can take their first steps in their adventure with artificial intelligence.

The educational structure of CampusAI is a multilevel ecosystem designed to fully harness the potential of artificial intelligence to support the educational process of participants at every stage of their development. On each level/floor, users master different competencies. On the first level, participants familiarize themselves with the basics of artificial intelligence and the ethics of its use. The entire program is conducted by avatars and digital characters embedded in a specially created environment made with the latest gaming engine. The goal of this level is rapidly learning to generate content (in the form of texts and video images) using artificial intelligence. After acquiring this basic knowledge, participants move up to the next floor, where they have the opportunity to apply their skills in various community projects (creating radio content, magazines, art galleries, or publishing books). Group work facilitates the exchange of experiences and the development of collaborative skills.

The next floor up, known as the AI Gym, allows students to develop individual AI-related competencies. At this stage, education becomes more personalized; participants can choose what they want to learn, and the system adjusts the program to their needs in real-time. The next step is the floor for the

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Modern technologies are now allowing education to seamlessly transfer into the virtual realm, creating a user-friendly environment where students can acquire new skills.

most ambitious participants, the so-called AI Makerspace. Here, anyone can develop their ideas and projects in an incubator or accelerator format. The top floor houses a club that brings together various organizations collaborating with CampusAI. This is a place for making valuable contacts, collaborating with other organizations, and sharing knowledge and experience. This space does not exist in the real world, yet all its elements are closely connected to the real world.

Open Platform

One of the pillars of CampusAI is its sophisticated technological platform, anchored on a distinctive engine that facilitates seamless integration with other systems through API interfaces. This innovative architectural design paves the way for further collaborative partnerships, enabling various organizations to contribute to and benefit from this burgeoning ecosystem. Kozminski University in Warsaw was the first institution to establish its presence in this virtual landscape, creating its own "building" alongside CampusAI, perceiving this not in terms of competition but as an opportunity for synergy and mutual growth. This strategic alliance is primarily focused on redefining educational paradigms: working towards the education of the future. The overarching goal of this initiative is to nurture local innovation ecosystems. By offering a versatile platform, it aims to streamline both learning and professional development in artificial intelligence, while also serving as a dynamic forum for discussing and optimizing the formation and evolution of these innovative ecosystems. ■

Further reading:

www.campusai.pl

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The Upcoming Museum of Natural History in Warsaw

The processes governing the environment around us are complex and interrelated, with seemingly distant issues intertwining with each other. The burning of fossil fuels is linked to climate change, which in turn is causing the extinction of coral reefs and the disappearance of natural fish habitats. Even the influx of migrants to Europe has its root cause in climate change. This is why education and raising awareness are so important, so as to enable citizens to make rational decisions as individuals and as a society.

Scientists in the United States have long understood this need, grappling with populism, climate denialism, and creationist movements. Washington is home to one of the world's most magnificent natural history museums – the Smithsonian National Museum of Natural History (NMNH). It is a vibrant institution, employing over 70 distinguished scientists and nearly 100 collection specialists, assisted by over 200 volunteers. The natural collections (geological, paleontological, botanical, and zoological objects) have been systematically studied and expanded since the museum's inception in 1910. Currently, they number over 140 million specimens, held in secure and well-managed warehouses. The scientific infrastructure includes well-equipped laboratories and an affiliated marine research station in Florida. Thanks to the hard work of the scientists at NMNH, its exhibits are continuously updated to reflect the latest scientific discoveries. The museum is visited annually by several million people, including American congressmen with their families during the so-called Smithsonian Congressional Nights, where scientists have the opportunity to convey the excitement of their research and discoveries directly to policymakers, contributing to a better understanding of the role of science in society.

In Poland, a National Museum of Natural History was established in 1919 (around the same time as the Smithsonian Institution), but a museum building was never constructed. Numerous hindrances have included the outbreak of World War II, the post-war reconstruction costs, and later the economic transformation after 1989. Poland is now the only European country without an institution of this profile. Looking at the many examples of natural history museums in Europe and the United States, the recipe for success is clear and well-established: state financial participation providing exhibition infrastructure, the involvement of scientific institutions with unique collections, and a staff of distinguished scientists ensuring the scientific accuracy of the exhibits. In 2023, the Polish Academy of Sciences proposed to the Ministry of Culture and National Heritage a vision of a scientifically vibrant Museum of Natural History. According to the preliminary schedule, the museum is expected to be established by 2030. The plan actually calls for the creation of two institutions: a National Museum of Technology and a Museum of Natural History, which are to be located in the now-empty areas surrounding the National Stadium in Warsaw. Along with the museum, buildings housing institutes of the Polish Academy of Sciences will also be constructed here, serving as a research base for the newly established facility. There is no better formula to make the scientific mission of the PAS institutes that hold natural-science collections more understandable and useful to society. ■

MARCIN KMIECIŃSKI

In the now-empty areas surrounding the National Stadium (between Aleja Zieleniecka, Skola, and Grochowska streets in Warsaw), a new complex is to be created, including a National Museum of Technology and a Museum of Natural History

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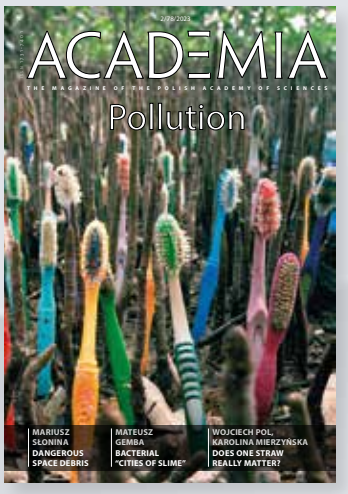

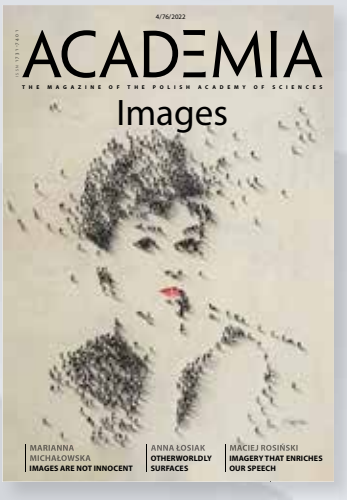

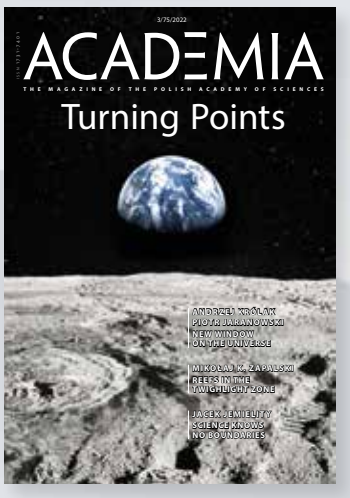

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