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INTRODUCTION

Today, the growing convergence of the humanities, social sciences and natural sciences can provide new insights into various subject matters, adjusting the existing assumptions or even overturning the truths that have been considered axiomatic for many centuries. The analytical capabilities provided by the natural sciences, the use of IT and the application of artificial intelligence have already proven their worth in helping us to revise our assumptions in the so-called 'pure humanities', making new discoveries possible in history, art, architecture, restoration of cultural heritage and museology today and in the near future. It is the new research methods that make the research in cultural history and theory especially exciting, opening up new, unprecedented professional opportunities for every specialist in these fields in his / her professional development.

The 2nd International Conference of the Art Academy of Latvia "Synergy Between the Humanities and the Natural Sciences in Cultural History and Theory" organized by The Department for Doctoral Studies of the Art Academy of Latvia on June 16-17, 2022, gave 50 speakers from nine countries an opportunity to share their experiences and to enrich their understanding of their respective fields of study.

The rapid evolution of the natural sciences to some extent outpaces progress in both the humanities and the social sciences, which necessitates the sharing of experience by the practitioners in each of the given epistemological domains. The conference aimed to define the relationship of art history to cognitive science and to determine the role that the methods and techniques used in the natural sciences can play in the research in the humanities. We hope that the current peer-reviewed collection of conference papers will be of interest to researchers in both the humanities and the natural sciences in the Baltic countries and beyond, reaching a wide international audience. Moreover, we hope that the articles in this volume will contribute to the process of crosspollination between the humanities and the natural sciences, encouraging more and more researchers in both fields of study to learn from one another and to employ interdisciplinary research methods in order to gain an ever wider range of insights.

In accordance with the recommendations by an international group of reviewers, we have selected 16 conference papers for publication. The articles included in this volume discuss new and promising research methods and make valuable contributions to the study of art history in conjunction with the natural sciences.

We are very grateful to Princeton University Professor of Art and Archeology, Thomas Da Costa Kaufmann, an outstanding researcher of European Renaissance culture, for outlining the history of the relationship between the natural sciences and the humanities and for providing a theoretical framework for the further discussion of this relationship.

His speech at the opening of the conference revealed not only the benefits of the growing cooperation between the natural sciences and the humanities, but also the pitfalls to be wary of while pursuing the synergy between the two domains of knowledge. His presentation encouraged every conference participant to intensify their search for arguments and evidence to substantiate their hypotheses and to believe in the value of their research.

By inviting Jekaterina Erenpreisa, a researcher, academician and genetics specialist at the Latvian Biomedical Center to take part in our conference, we wanted to get a natural scientist's perspective on art. Although the images of cancer cell cytology under an electronic microscope might differ from Van Gogh's imaginative scenes inspired by Japanese art, in her article the professor affirms the close interrelationship between intuitive and cognitive processes in both natural sciences and artistic creativity.

We were very happy to see that our conference had attracted participants not only from Latvia but also from such countries as the UK, Germany and Denmark: Simon McKeown from Marlborough; Anke Naujokat, Barbara Uppenkamp, Sara Dolls and Michael Jansen from Aachen; and Ruth Sargent Noyes from Copenhagen. Their participation helped to expand the thematic diversity of the conference. Their articles take an interdisciplinary approach and draw upon such diverse fields of study as iconography, emblematics, theology, architecture and art restoration. They reveal important developments in the material and spiritual culture of the past several centuries and make an important contribution to the study of European and Baltic art history.

We were greatly saddened when one of the most enthusiastic and passionate conference participants, Aachen Technical University professor Michael Jansen, passed away on July 13, 2022. However, the importance of his achievements as a researcher of ancient cultures, archaeologist and restorer of artworks in Asia transcends the boundaries of time and space. Therefore, we have reconstructed his conference presentation from the transcription of its audio recording and included it in the collection in an edited form.

The Latvian researchers who took part in the conference explore a wide range of themes in their articles, combining methods and approaches from both the humanities and the natural sciences in order to gain new insights into their subjects. Ivars Magazeinis's article explores the use of WWI military aerial photography in the reconstruction of the material and cultural urban environment in Daugavpils in the first half of the 20th century. Analyzing the execution of the order issued in 1567 by the Duke of Kurzeme and Zemgale, Gotthard Ketler, to build 70 new churches, Ojārs Spārītis draws attention to such statistically proven trends as the dynamics of church construction, the use of building materials, the change in the denominational affiliation of churches, etc. Two of the conference participants – Sanita Bitko and Līna Birzak-Priekule – have devoted their articles to the use of augmented reality and other digital technologies in the creation of artworks and in the restoration of lost or damaged artworks. Dina Suhanova's article provides an insight into the sociology of material culture by examining various uses to which hoarding and collecting material artifacts may be put in artistic practices. Agnese Zviedre analyzes the effectiveness of the digital audio guide created by the Latvian National Art Museum during the Covid-19 pandemic for improving the accessibility of the museum collection and assesses its usefulness from the point of view of public mental health and well-being. Delving into the field of art psychology, Iveta Feldmane stresses the importance of the theory of affect in the analysis and interpretation of works of art. Even more specifically, by delving into the field of neuroscience, Ieva Melgalve considers the cognitive nature of memory and memory mechanisms, which allow an individual not only to store recollections of past events but also to imagine future scenarios and to develop empathetic understanding. The collection of articles is concluded by two publications which explore the interrelations between industrial production, textile art and fashion design. Māra Binde, a lecturer at the Department of Fashion Design, explores the use of zero-waste technologies in the fashion industry from the point of view of the circular economy. Her article is of great interest to all who are interested in reducing waste. By looking into the textile mosaics of the Latvian textile artist Inta Amoliņa, doctoral student Elīna Veilande-Apine, outlines the history of this art form and reveals the unique qualities of Inta Amoliņa's contribution to it.

International scientific conferences on issues of theory and practice, as well as in the fields of the natural sciences, humanities and social sciences, are an integral part of contemporary global research. With its annual thematic conferences, the Art Academy of Latvia marks its unique place in the fabric of world education and science. In terms of the selection of conference themes, we follow global trends in theoretical and practical approaches to cultural and artistic phenomena. With internationally peer-reviewed conference proceedings in English, we reaffirm the unique place of our Northeastern region on the European cultural map and expect to continue doing so in the future.

CONTENTS

SOME REMARKS ON THE RELATION OF THE NATURAL SCIENCES TO THE HUMANITIES

Thomas DaCosta Kaufmann
Princeton University

It was with some trepidation that I accepted an invitation to deliver remarks on the relation of the Humanities (*sciences humaines*, *Geisteswissenschaften*, and their equivalents in other languages) to the Natural Sciences. While I am interested in the history of what are now called the natural sciences and their relation to the history of art and other aspects of cultural history in the early modern era[1], I can hardly claim to be an expert in the former. This is moreover an old and much debated question, most sharply defined by C. P. Snow when he proposed that two separate intellectual cultures existed that could not communicate with each other.[2] The present volume and the conference on which it was based assume the opposite. I agree with their intention and with critics of Snow who have argued that the sciences and the liberal arts or Humanities can and do communicate with each other in non-trivial ways.[3] The question is how.

To paraphrase the invitation I received, the suggestion that borrowing the analytic methods and tools of the natural sciences is the way communication or collaboration with the Humanities happens nevertheless seems somewhat to misstate the issue. To be sure reference may be made to the old Baconian notion of the scientific method that describes how empirical knowledge is gained by induction from particulars following a certain order, and this notion might seem to apply to the Humanities as well. But this idea of method is problematic, as several noted philosophers of science have argued: it is not methodology per se, and certainly not the inductive method, that characterizes the growth of scientific knowledge.[4] One famous thesis holds that hypotheses (conjectures) are formulated that are proved or in one familiar philosophy of scientific discovery disproved or falsified.[5] Another well-known argument proposes that certain common assumptions (sometimes called normal science) are shared and that new theses or hypotheses (revolutionary science) may cause them to be rejected, reformed, or amended[6].

Furthermore as Wilhelm Dilthey, a founder of modern philosophical hermeneutics, argued, understanding was the aim of the *Geisteswissenschaften*, the Humanities, and in this regard although they were equally "scientific" (*wissenschaftlich*) they differed from other *Wissenschaften*.[7] Hans Georg Gadamer made the distinction stronger by distinguishing between truth and method, arguing that hermeneutics, defined as the philosophy of interpretation, is not merely a method of interpretation but an investigation of understanding transcending it.[8] Although these arguments have also been debated, it would seem that method is not a very useful notion either for defining distinctions between, or finding connections among, fields of inquiry.[9] On the other hand, the tools they use (for example iconography in one case, statistics in another) in approaching a problem might help not just to differentiate between but to connect fields of study. While we don't change a tire with a saw, as the thrust of this volume suggests, we may however borrow tools, just as we might use someone else's tire wrench—and that leaves open the possibility for connections.

One area that might at first appear to distinguish the Humanities from either the Natural or the Social (or applied sciences) is their comparative lack of mathematical models or systems of analysis. Perhaps this situation has resulted from considerations of works of art, literature, and music in the study of which what the Scholastics said might pertain: *individuum est ineffabile*, the individual is incommunicable.[10] Exactly quantifiable data of significance such as are available for analysis in the "exact" sciences that allow for determination of trends or testing generalizations are either not usually identifiable in fields like the historical study of art or literature, have not been accumulated, or at least have not yet led to significant results.

But it is not necessary to be positivist, a position attacked by philosophers of the Frankfurt School who spoke across other philosophers of science in regard to methods of analysis[11], to see how the interpretation or understanding of objects may involve the application of skills, or insights taken from other fields in the varied Social and Natural Sciences that both provide information and help identify and perhaps subsequently formulate further argument. In addition to the accumulation of data, new approaches to, or understandings of, material may help not just to acquire knowledge, but also to deepen, reinforce, or correct interpretations.

Digital Humanities has begun to burgeon, as data bases of images, books, word uses, and statistics have been assembled. Some non-trivial and quantifiable data does exist, and one may think of applying analysis of it to several sorts of problems. Some examples are the study of word frequency in prose or poetry, of syntactical repetition, of rhyme patterns in literature, or of the frequency of use of colors and patterns of design in art. Data for questions of this sort may be assembled, and then categorized and analyzed by computation. It remains however to be determined what results analysis of this data may bring, as distinct from the use of data contained in such banks of information, hence what the eventual effects might be.

Aside from Digital Humanities, several examples may be adduced in ways in which tools of the Natural Science (and Mathematics) have already enriched the Humanities. Three may be mentioned in regard to the history of art and culture. One involves the use of optics, and

1 See for example Thomas DaCosta Kaufmann, *The Mastery of Nature. Aspects of Art, Science, and Humanism in the Renaissance*, Princeton,1993, Arcimboldo: Visual Jokes, Natural History, and Still-Life Painting, Chicago and London, 2009

2 Delivered as the Rede Lecture and first published in book form as *The Two Cultures and the Scientific Revolution*, London, 1959.

3 See Guy Ortolano, *The Two Cultures Controversy: Science, Literature and Cultural Politics in Postwar Britain*, Cambridge and New York, 2009.

4 See the varied and different critiques of Hans Georg Gadamer, *Truth and Method*, Foundations of Philosophical Hermeneutics, London, 1975 (translation of *Wahrheit und Methode, Grundzüge einer philosophischen Hermeneutik*, Tübingen, 1960) Karl Popper, *Conjectures and Refutations. The Growth of Scientific Knowledge*, London, 1963; Imre Lakatos, "Falsification and the Methodology of Scientific Research Programs," in *Criticism and the Growth of Knowledge*, ed. Imre Lakatos and Alan Musgrave, Cambridge,, 1970, pp. 91-195; Paul Feyerabend, *Against Method*, New York and London, 1988.

5 Karl Popper, *The Logic of Scientific Discovery*, Abington-on-Thames, 1959 (first English edition).

6 Thomas Kuhn, *The Structure of Scientific Revolutions*, Chicago, 1962.

7 Wilhelm Dilthey, *The Formation of the Historical World in the Human Sciences*, ed. Rudolf A. Makkreel and Frijthof Rodi, Princeton and Oxford, 2002 (translation of *Der Aufbau der geschichtlichen Welt in den Geisteswissenschaften*, Berlin, 1910).

8 Gadamer, *Truth and Method*.

9 Consequently in my own teaching and writing I prefer to use historiography or the literature of art rather than methodology.

10 See Thomas DaCosta Kaufmann, "Periodization and its Discontents," *Journal of Art Historiography*, June, 2010, with further references to E. H. Gombrich.

11 *Cf. Was bleibt vom Positivismusstreit*, ed. Reinhard Neck, Frankfurt a.M., 2008, following *Der Positivismusstreit in der deutschen Soziologie*, ed. Frank Benseler, Neuwied and Berlin, 1969.

techniques of so-called scientific analysis of paintings. Infrared imaging has opened up a whole area that, if not ineffable, was previously invisible, namely the existence (and study) of underdrawings in paintings. Some caveats: not every painting has underdrawings; many are not visible because only carbon based pigments allow them to be perceived; and some were already visible with the naked eye. The empirical data revealed requires also further interpretation. This becomes clear if we read some of the common misunderstandings that art historians have had when they call upon the mere existence of an underdrawing to establish an attribution. For just as an artist who is a member of a workshop, either someone now known by, or obscure to, art historians, may have had a hand in executing a painting in an atelier, so an assistant may apply a cartoon to a panel or canvas, and that cartoon may be used to produce multiple examples of the same composition.[12] Still, the study of underdrawings has already been extremely illuminating.

A second area that has proved very fruitful is the use of DNA analysis in historical inquiry. The application of genetic investigations to the dead—even to those long dead---has revealed many patterns of human geography, with applications for cultural history and geography. DNA has allowed patterns of migration, kinship, and circulation of people in the past to be traced. On the basis of DNA analysis it has been demonstrated that culture was diffused along with genomes.[13] However, archaeological discoveries have not only confirmed this thesis but demonstrated that artifacts traveled much more frequently and much farther than did people.[14] This apparent discrepancy indicates that trade and circulation existed from the earliest times of human existence on the planet. It also suggests that that global (or at least regional) exchange can flourish even when (as in the existence of what may be better called the silk route than the silk road, because it had many stops rather than being one continuing road) people do not carry objects for long distances but transmit them over limited spaces and in longer intervals of time.[15]

A third area is the use of data analysis as it has generated the new and growing field of Data Science. Data analysis involves the procedure of mapping data and consequently has many possible applications for the Humanities (and Social Sciences) in the form of Data Analytics as an instantiation of Data Visualization.[16] Geographers and historians of art have long been involved in similar processes when they map various artistic phenomena such as diffusion.[17] Visual presentation of data is now often used to present features like gender

12 Some fundamental references: M. W. Ainsworth, "Northern Renaissance Drawings and Underdrawings. A Proposed Method of Study," *Master Drawings* 27, 1989. pp. 5-38; *underdrawings in Renaissance Paintings*, ed. David Bomford, London and New Haven, Ct., 2002; *Recent developments in the technical examination of early Netherlandish painting: methodology, limitations & perspectives*, ed. Molly Faries and Ron Spronk. Cambridge, Mass. and Turnhout, 2006.

13 See in particular L. L. Cavalli-Sforza and M.W. Freeman, *Cultural transmission and evolution : a quantitative approach*, Princeton, 1981, among many other works by Cavalli-Sforza.

14 See Daniel Shryock and David Lord Smail, *Deep History. The Architecture of Past and Present*, Berkeley, 2011, for a longer view of this topic.

15 See for example Thomas DaCosta Kaufmann, "World Art History as a Conversation between the Prehistoric and the Contemporary" in *Mix and Stir: New Outlooks on Contemporary Art from Global Perspectives*, ed. H.P. Westgeest, Amsterdam, 2021, pp. 387-393, with further references to discussions of the earliest art.

16 *Elizabeth Clarke, Data Analytics, Data Visualization and Communicating Data*, North Haven, 2022, provides an easily accessible introduction and guide.

17 See Thomas DaCosta Kaufmann, "Adam Miłobędzki, Mapping and the Geography of Art," *Rocznik Historii Sztuki*, 30, 2006, pp. 23-29, and in general idem, *Toward a Geography of Art*, University of Chicago Press, Chicago and London, 2004.

or racial diversity in the art market and museum, although these displays may be called demographic or sociological. Scholarship in the Humanities has, however, seldom applied other concepts, like cluster analysis, that have been adapted by Data Science.[18] Although the use of cluster analysis in archaeology has been pointed out[19], its wider applicability for the Humanities remains to be realized.

Nevertheless, some recent applications of methods to history and art history that involve data analysis and resemble cluster analysis in applied mathematics are noteworthy. These include studies of network analysis of imperial ambassadors and visitors to the Porte, the court of the sultan in Istanbul/Constantinople, and related analyses of alba *amicorum* (*Stammbücher*, autograph albums) that have demonstrated the existence of hitherto unrecognized cultural connections and patterns.[20] The scholars who have tracked them have specifically indicated that they used data network analysis, if not specifically cluster analysis, although I have been informed that the technology involved has not reached a level in which this sort of analysis could provide much more than simple graphing or mapping of the sort that has already been applied in historical and other kinds of research.[21]

While the term 'network' is current in the Humanities and Social Sciences, this may also not directly relate to the meanings the term has in Computer or Data Analysis. When I asked them, neither the mathematician/computer scientist, who is an important network analyst, nor the historian, who collaborates with such scientists, seems to have been aware of the use of the term "network" as it has recently been deployed by the recently deceased sociologist and Parisian *maître à penser* Bruno Latour.[22] While Latour's ideas have become fashionable among trend-following art historians, it is significant that even though he was attentive to art, architecture, and topography and utilized photographs in his own presentation of actor-network-theory, Latour did not graph or map networks.

In conclusion, one may observe that attempts are being made to devise and employ models or tools in the Humanities that are in use in the Natural (and Mathematical) Sciences, not merely metaphors (something Snow decried), to test empirically and increase knowledge of the universe from the most microscopic to the most macroscopic scale. In this regard such models do not accord with the all too frequent and, to my mind, often fruitless interior conversations about method and theory, which in the North American and to some extent Anglo-Continental World of Art History often seem to have taken over large tracts of academic discourse. This has happened especially in those Humanities that deal with twentieth century and twenty-first century cultural expression. Thus, despite collaboration and borrowing, the question of how much crossover exists between the Humanities and the Natural Sciences remains to be answered more fully than is possible to do at the time and space limited by the given conference. I leave it to those better informed (and most are) than I am to say what comes next.

18 See Brian S. Everitt et. al., Cluster Analysis, Chichester, 2011 (5th ed.)

19 *Ibid*., p.12

20 As presented in previous lectures and essays now comprehensively assembled in Robyn D. Radway, *Portraits of Empires: Habsburg Albums from Ottoman Constantinople*, Bloomington, Indiana, 2023, forthcoming.

21 Personal communication from Robyn Radway.

22 Bruno Latour, Reassembling the Social. And Introduction to Actor-network-Theory, Oxford, 2005. The mathematician is the Sterling Professor of Computer Science, Director of the Institute for Foundations of Data Science, and Co-director of the Yale Institute of Network Science, all Yale University, consulted May, 2022; the historian is Robyn Radway.

COMPLEXITY, CIRCULAR CAUSATION, AND BOUNDARIES IN SCIENCE, ART, AND SOCIETY

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ABSTRACT
The article is devoted to the thermodynamic principles of regulation of the complex open systems acting at the edge between order and chaos. These physical laws also operate in biology (for example, in genome regulation), art, and society. The creativity of chaotic options is limited by permissive paths of adaptation to the environment. In human society, existing boundaries represent a cultural code.

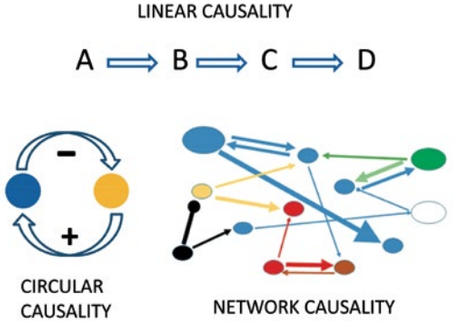
"The music of life plays itself" (Denis Noble)
"Every new idea looks crazy at first glance" (Niels Bohr)

INTRODUCTION

Art, natural and social sciences can find a common language for the mutual exploration of the regulatory laws of the living systems. These systems are, firstly, open. This means that they exchange energy and matter with the outer world. Secondly, they are complex. So, the question can be formulated: What are the laws according to which complex systems adapt to the ever-changing, sometimes existentially threatening, environment? In general, these are laws of self-regulation (Erenpreisa and Giuliani 2020). Denis Noble also describes it as biological relativity, "a dance to the tune of life" (Noble 2011; 2016). The perhaps discomposed natural scientist would ask if there exists any certainty and where the boundaries of biological relativity are? To reply to this question and to show the common features of regulatory mechanisms in art and society we should first address the issue of causation.

BOTH-WAY CAUSATION AND BIOLOGICAL RELATIVITY

There is a linear, circular, and network causality (Fig.1).



As seen in Fig.1, in the case of linear causality, A causes B, B causes C, etc. For example, the linear sequence of the DNA triplet code determines the information of unique genes, which is transcribed in the cell nucleus as RNA molecules, which are translated in the cytoplasm by the synthesis of amino acids of unique proteins. However, linear causality acting alone does not provide feedback for the system's adaptation to the changing environment. Circular causation of negative feedback joins two regulatory elements providing the balance of the adapted order. Circular causation is at the core of the responsive system. That means that by exploring one side of the phenomenon, you will often find its "other side" or get stuck upon the transient state of both opposites being present. The idea of duality was elaborated by the Chinese "Yang-Yin Unity" and Kant's philosophy, long before it was done by physicists. This situation was excellently described by the Latvian physicist Edgars I. Siliņš in his book of essays (Siliņš 1999); the duality was intuitively perceived and richly elaborated by surrealist art (as described below).

In turn, complex systems composed of several or many elements (e.g. about 23 thousand genes in the human genome) act as networks, embracing both linear and circular interactions (Fig.1). More than that, at a given instant, each element of the network examines the signals arriving from the links with other elements of the system. The order in the network is created in complex systems by self-organization acting from the origin of life, to the rise and fall of great civilizations (Kauffman 1969; 1993; 1995). Biological relativity means that there is no privileged level of causation. Instead, multi-level 'both-way' causation occurs (Denis Noble 2011). Although 'both-way' causation seems counter-intuitive, in my own experimental work on the DNA organization in whole cell nuclei, I have arrived at a similar conclusion on the non-hierarchal participation of every level of the DNA packaging in the realization of its other organization levels (Erenpreisa 1990, 115). Thus, the science of complexity enters the non-linear physics of the open systems, which are far from being in a state of equilibrium and whose physical laws and effects operate in living systems, art, and society (Kauffman 1993, 1995). However, it would be naive to believe that such eureka can enlighten anybody. When the famous microbiologist Louis Pasteur became Dean of the brand new Faculty of Sciences at Lille, in his inaugural speech he said: "*Chance only favors the prepared mind*" (Pasteur 1854, emphasis added).

THE MUTUAL INSTRUMENTS OF EXPLORATION IN SCIENCE AND ART: ANALYSIS AND IMAGINATION

Our main instruments of exploration of nature are the human analytical mind and the imagination. Albert Einstein, the founder of the theory of relativity, once said, "*I am enough of the artist to draw freely upon my imagination. Imagination is more important than knowledge. Knowledge is limited*" (Online 1). We can also mention intuition and inspiration among these instruments. In the preface to his book "Science and art are based on the same principles and values", the famous cell biologist Lima-de-Faria writes: "Science is written, and art is painted, not with ink or colors, but with one's own blood. There is no place for the meek" (Lima-de-Faria 2020). It is well known that revelation often comes to a scientist in a night dream or at the moment of awakening after days and weeks of "obsession" with a problem. Similarly, the imagination of an "obsessed" artist finds an original solution in a masterpiece. Imagination is an engine of discovery. Niels Bohr, the founder of quantum physics (Nobel Prize 1922) once said to his student "Your theory is crazy, but it's not crazy enough to be true" (Online 2). The phase-transitions and bistable-switch was one of such "crazy theories".

PHASE TRANSITION: A BI-STABLE SWITCH AND "THE TWO FRIDAS"

A theory of phase-transitions was developed by the passionate Nobel Prize (1962) winner in physics Lev Landau in one of his articles (Landau 1937). It is at the very basis of the physics of self-organization. It is simply explained and an example explored in art is presented in Fig.2.

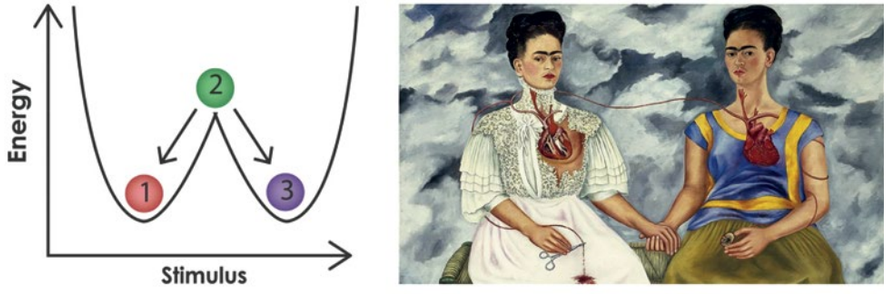


Fig. 2. Left: A principal physical scheme of the phase transition from a stable state (1) to a stable state (3) through a dual metastable state (2) possessing higher energy (E), where X is space/time; Right: "The Two Fridas", rejected and adored, both sharing blood and heartbreak, the famous dual self-portrait by Frida Kahlo (1939), one year after divorce. (https://d3k8cp7ga1ip8x.cloudfront.net/media/meural/254/vz00fol-17e1rdb7.optimized.thumb.jpg)

THE GOLDEN RATIO AND THE BEAUTY OF PERFECTLY PROPORTIONAL SPIRALS IN NATURE AND ART

Pythagoras' (570 – c. 495 BC) theorem of the Golden Ratio is considered a divine formula of nature that determines beauty. The Golden Section is a line segment divided into two parts, such that the ratio of the short portion to the longer portion is equal to the ratio of the longer portion to the whole. This sequence presents itself as the golden ratio in the physical world; it gives order to the seeds of sunflowers, petals of daisies, and patterns of pinecones. It is pervasive and creates perfectly proportional spirals. The golden ratio can be found in many masterpieces of such Renaissance masters as Michelangelo, Albrecht Durer, and especially Leonardo da Vinci. Interestingly, the structure of the DNA spiral also obeys the law of the golden ratio. The American biologist Dr. Susumu Ohno believed that the evolution of complex life through the introduction of repetitive DNA sequences in the genome was akin to the evolution of complex musical melodies. To show this, he worked together with his wife, the musician Midori Ohno, to publish a beautifully written article comparing the repetition in the DNA with the overlapping, repetitive melodies in music (Ohno, S., Ohno M. 1986). In this paper, they showed how the DNA could be translated into music and vice versa, revealing the beauty hidden in the DNA.

THE FRACTAL GENOME, ART, MUSIC, AND THE BUTTERFLY EFFECT IN WEATHER AND SOCIETY

Susumu Ohno, in fact, genially highlighted the DNA repeating (self-similar) sequences (Fig.3 A), providing the rhythms in the scanning of the genomic linear information (during DNA replication and transcription), for creating "music of life" which "plays itself" (D. Noble 2016).

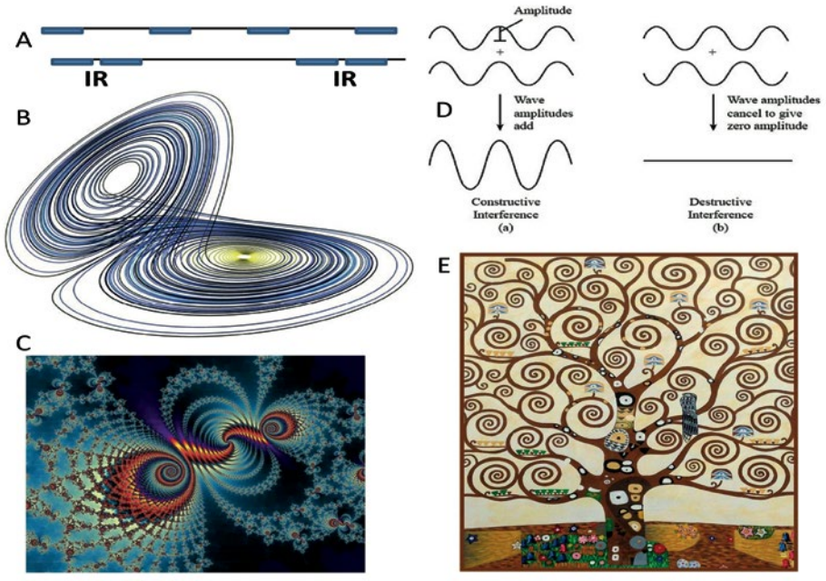


Fig. 3. Fractality and interference. (A) Nucleotide sequence repeats in the linear DNA, IR – inverted repeats; (B) Lorenz chaotic attractor; (C) fractals in music patterns; (D) Constructive and destructive interference of two waves ; (E) Gustav Klimt "The tree of life"(1910-1911). (Sources: (B) Paul Bourke (http:// paulbourke.net/fractals/lorenz/; (C) https://lh3.googleusercontent.com/NTfk50ZE9oRo X1r3INITZIsFQNlsrtCvP9W0juZ-p1cSBsvAHA-nFxCqR8C0Z85lHQMTAHqDPj1EtctxVB-z7mSadEm31NmFTyhDOfcfnzg; (D) https://homework.study.com/cimages/multimages/16/interference4348924078279660770.jpg.)

Now we know more: the compacted knots of the genome network composed by these silencing repeats really fluctuate and pulse the performance of the DNA information in space and time (Erenpreisa et al. 2023). This activity is conducted by the daily circadian rhythms of the Earth rotation, which is sensed by subverged shorter rhythms of the cell life, adapting cells for the emergent environmental feedback; it is working as timing in space like gear-wheels, or fractals (Erenpreisa et al., 2021; 2020/2022; 2023; Vainshelbaum et al., 2022). Fractals are geometric structures characterized by repetition of a pattern on different scales. Rhythmic 3D fractals reflect the behavior of chaotic attractors in complex systems. A paradigm of chaotic behavior, the Lorenz chaotic attractor (Fig 3B), was revealed by him mathematically for weather forecast (Lorenz EN 1993). But first, Benoît Mandelbrot (1975), a Polish mathematician, helped in understanding the fractal geometry that would be applied to music. Moreover, through the use of computers, Mandelbrot detected the fractal patterns present in nature (Mandelbrot, 1975). The key in fractal music is also the self-similarity patterns of information (Fig.3C). Moreover and more recently, Winters has mathematically shown that the Lorenz attractor can be presented as a way of musical mapping (R.M. Winters IV 2009).

From a biological viewpoint, based on my own and my group studies described above (Erenpreisa *et al*., 2021; 2022; Vainshelbaum *et al*., 2022) I hypothesize here that the behavior of the complex system, like the Lorenz chaotic attractor, may be the way how the human cell genome is scanning through its approximately 23,000-gene-memory,

accumulated through 3.5 billion years of life evolution, its two main parts, the basic memory of the unicellular life and the derived multicellular life (crowned by *Homo sapiens*), back and forth, enrolling the subverged metabolic dimensions, doing so daily, for adaptation to the environment. The reference points for this scanning would be the repeated sequences in the linear structure of the DNA, initially postulated by S. Ohno for musical cords. Here we can apply the interference physics of two combining waves (Fig.3D). The constructive interference would amplify 'the sound' of gene expression, while inverted repeats (IR on Fig.3A) should impose silence. This destructive interference in the 'music of life" produced by IR, may be at the basis of gene transcription silencing effect (known in genetics as a stochastic position effect variegation) (Online 3).

The visual fractal art came into existence in the 1890s. Gustav Klimt (Fig.3D) and Escher were its brightest representatives. Lorenz attractor is similar to a butterfly not only visually: the fractal waves can cause the so called "butterfly effect" (a disproportionally huge impact in complex systems). In this case, a small change in the initial conditions can lead to the critical cell-fate change (Erenpreisa et al., 2023; Matsumoto et al., 2022), like a distant hurricane described by Lorenz. The same 'butterfly effect' can initiate revolutions (e.g., bread shortage in Paris helped to ignite the French Revolution in 1789) (Giuliani A. in Erenpreisa et al. 2023). All this occurs because the complex systems are living "at the edge of chaos".

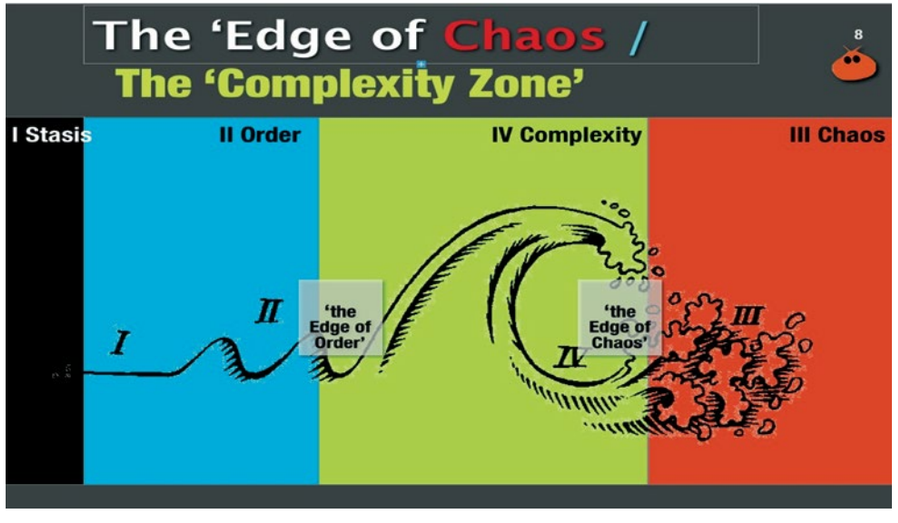


Figure 4. Complexity at the edge of chaos, Arthur Battam (https://plexity.wordpress.com/zomes-at-the-edge-of-chaos-good-enough-systems-a-p-battram-independent-)

ADAPTATION AT THE EDGE OF CHAOS

Ilya Prigogine won a Nobel Prize (1977) for his contributions to non-equilibrium thermodynamics of open systems describing the creation of order out of chaos, through fluctuations (Prigogine 1977; Prigogine, Stengers 1978). An interesting drawing by Arthur Battam in Fig.4 illustrates how the order supported by small, nearly harmonic oscillations in the relatively simple system becomes settled in complex systems by gigantic waves at the "Edge of Chaos". This gigantic wave characterizes the break of symmetry, previously supported by small oscillations, and the irreversibility of the time flow.

Chaos is creative. Here, at the edge between order and chaos, the environmentally challenged system entering the rigorous oscillations may come (purely by chance) upon the escape attractor – the newly balanced space state and rewire its genome network (Lewin 2020). However, although the attractor options for development may be many, the permissive paths to this environmental comfort of the new cell-fate are few (Bizzarri et al. 2020). This inevitable chance at the edge of chaos is unfortunately used by highly plastic and adaptive cancer cells. It means, for example, that, although most cells will die due to cancer cell-killing therapy, a few will nearly always escape and cause a relapse of the disease (Pisco, Huang 2015; Erenpreisa et al. 2020/2022; Erenpreisa, Giuliani 2020). Therefore, the treatment of cancer in individual therapy needs a systemic approach where these evolving permissive paths are dynamically defined.

HOMO SAPIENS, "EXTENDED MIND", INFORMATION BUBBLES, AND WHAT WILL SAVE THE WORLD

Turning now again to social systems, let us first define and discuss the boundaries of the human mind. Notably, Homo sapiens is a social animal with a developed mind. The construction of Homo sapiens from the lowest layers (DNA-RNA-proteins-cells-tissue-organs-organism) is depicted by Noble and colleagues as crowned with a cloud enclosing ethics, laws, culture, and social interactions (Noble R. et al. 2019). In his popular work on simplicity and complexity, Murray Gell-Mann (a Nobel Prize winner in physics of particles, 1969) writes, "In biological evolution, the experience of the past is compressed in the genetic message encoded in DNA" (Gell-Mann 1994). In the case of human societies, Gell-Mann argues that the schemata (or boundaries – J. E.) are institutions, customs, traditions, and myths. They are, in effect, kinds of "cultural DNA code". Apparently, cultural code is a prerogative of the human social mind. Clark and Chalmers (Clark, Chalmers 1998) suggested an interesting hypothesis of the "extended mind". Their paper not only challenges the boundaries that differentiate the natural and the artificial, body and machine, but also, first of all, asks the question: "*Where does the mind stop, and the rest of the world begin?*" Our mind is largely formed by our prehistory, family, social contacts, read books, our gadget memory, etc. The undereducated person feels the need to seek comfort and accept the information which corresponds to his/her world view. In some way, this person lives in the information 'bubble", preferring black/white interpretations and explanations of what happens in society. The collision of the opposite rigid bubbles may lead to the chaos of "Guernica" (Picasso's famous painting of 1937,

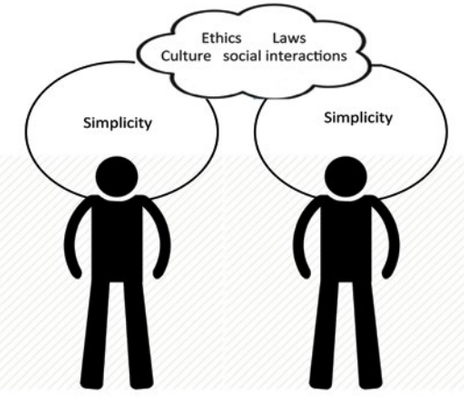


Fig.5. Schematic of the two "opponents" in their information bubbles of simplicity penetrated by a cloud of cultural education which could help them to understand each other's arguments, in the context of complexity.

depicting the bombardment of the city by the Nazis in the Spanish Civil War). And yet, a cultured and educated individual is more open to opposing viewpoints. Such a human being is searching for a path to balance in social complexity (Fig.5), often "at the edge of chaos". It is no accident that the UK prime-minister W. Churchill, whose wisdom saved the United Kingdom from the enemy invasion during the Second World War, was an excellent writer. In the classical novel by another outstanding writer, Dostoyevsky's *The Idiot* (1868-9), the main hero Prince Myshkin believes that beauty will save the world, although the mercantile people surrounding him consider Myshkin an idiot. Will art save the world? Let us stop with this rhetorical question.

CONCLUSION

In conclusion, the same laws of self-organization that regulate the complexity of living systems also operate in art and society, where development often occurs at the edge of chaos, limited by permissive paths, including ethical boundaries. Culture and creativity are essential to finding effective solutions to problems in these areas of human activity. These should be developed at all levels of education, from kindergarten through school and university.

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PRELIMINARIES AND LIMINALITY: IMAGES AND IMAGE-MAKING BETWEEN ART AND SCIENCE IN THE MILIEU OF CARL LINNAEUS

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ABSTRACT
Among the undisputed giants of the Age of Reason stands Carl Linnaeus (Carl von Linné – 1707-1778), the Swedish botanist and father of binomialism whose rigorous methodology in the realm of botanical description and categorization established a taxonomical system still acknowledged today. But isolating Linnaeus from the cultural currents of his time forges an ahistorical view of the man and his work that reifies him as a pioneering hero of empiricism. Historians of science have long noticed points of continuity between Linnaeus and a number of his predecessors at Uppsala, notably Olof Rudbeck the Elder and Olof Rudbeck the Younger, progenitors both in the field of plant categorization. Other scholars have commented on Linnaeus's skill at self-fashioning, and his promotion of a cult taken up by others redolent of the fashion for Sensibility in the later eighteenth century. The intention in this article is to take a synergistic approach in analysing Linnaeus's milieu of publication and cultural performance. How did the visual lexicon available to Linnaeus and his image-makers cope with new demands to make manifest unforeseen discoveries? What vocabulary of signifier, cipher, or symbol expressed the analytical methodology Linnaeus brought to bear upon his field? The evidence lies to a large extent in the imagery Linnaeus sanctioned for use in the preliminaries of his publications. These images, restricted to the liminal parts of his work, hint at a crisis of representation felt more widely in eighteenth-century science, where the limitations of the available artistic repertoire signal an emerging gulf in the modalities of expression between the visual imaginary and empirical epistemology.
Keywords: *iconography; Baroque; book history; botanical sciences; Linnaeus*.

The image in Figure 1 is a hand-coloured stipple print by William Ridley after a design by John Russell and John Opie and issued by the London publisher Robert Thornton in 1806.[1] It had first appeared without colour in 1799 for inclusion in a folio volume of engravings intended to be published as *New Illustrations of the Sexual System of Linnaeus*; when it did appear, the folio bore the more poetic name of *The Temple of Flora*. The plate carries an inscription below identifying the theme as 'Cupid, Flora, Ceres, and Aesculapius Honouring the Bust of Linnaeus', a title that takes us from the world of science into the realm of eighteenth-century grand-manner allegorical history painting. The scene presents a stone plinth surmounted by an *all'antica* bust set up in a wooded grove, a pictorial trope

1 British Museum, Department of Prints and Drawings, Museum number: 1895, 0408.9.

Fig. 1. William Ridley, after a design by John Russell and John Opie, 'Cupid, Flora, Ceres, and Aesculapius Honouring the Bust of Linnaeus,' stipple print with colour applied *à la poupée*, London, 1806. By kind permission of the Trustees of the British Museum.

Fig. 2. Francesco Bartolozzi, after a painting by Richard Cosway, 'Mrs Abingdon as Thalia Crowning the Bust of Shakespeare,' 1783, stipple engraving. By kind permission of the Trustees of the British Museum.

already well established within the visual repertoire of the Cult of Sensibility. Into this grove step four figures from the classical pantheon: Flora, goddess of flowers, Ceres, goddess of crops, Cupid, god of love, and Aesculapius, god of medicine. Through this cast of deities, Russell and Opie pay tribute to the great natural scientist, Carl Linnaeus, by having his effigy attended by goddesses of vegetation, but also by the god of healing, reminding us of the medicinal and pharmaceutical uses of plants, and by the god of love, whose power extends even to the sexual nature of plants. Indeed, the very act of vegetal procreation is allegorically performed by Cupid incising the stonework with the tip of his arrow.

Russell and Opie's work is playful, amusing, and in accord with the elegant taste of its day. Their presentation of Linnaeus's fame was chosen precisely because of the familiarity of its visual idiom and recognisability of its trope. By the end of the eighteenth century, it was commonplace to show dead authorities thus fêted and fetishized, converted into busts or statues, and removed to a sacred grove to be attended by reverential figures. In the seventeenth century, this theme had formed part of the revival of classicism, as exemplified by Nicolas Poussin's 'Et In Arcadia Ego' (1637-1638) or 'Bacchanalian Revelry before a Term' (1632-1633).[2] Through the eighteenth century the iconographic matrix had expanded and proliferated, becoming, particularly in British art, to some degree domesticated, providing visual shorthand for the cultural attainments of sitters in grand-manner portraiture. Instrumental in effecting this shift of sensibility was Sir Joshua Reynolds, whose nuptial portraits of aristocratic women, such as Lady Elizabeth Keppel in 1761, or Lady Elizabeth Montgomery in 1773, presented them paying tribute to Hymen, the god of marriage, in anticipation of their weddings.[3] Where the esteemed President of the Royal Academy led, others followed, and we see Reynolds's influence on the portraitist Richard Cosway in his allegorical likeness from 1783 of the actress Mrs Abingdon crowning the head of Shakespeare with laurel (Fig. 2).[4]

As with Shakespeare and the dramatic arts, the history of science holds a special place of honour for Linnaeus (1707-1778), more commonly known in his native Sweden as Carl von Linné.[5] Of course, he is remembered for his revolution of scientific methodology in the sphere of categorisation, elaborating upon a system of binomial nomenclature across the numerous editions of his seminal book, Systema naturae, first published in 1740, and culminating in the 2,300 pages of his twelfth, and last, edition of 1768. We know how the indefatigable Linnaeus wrote shelves of volumes of botanical description, cataloguing 15,000 species of flora and fauna, not to mention authoring no fewer than 186 academic dissertations (Broberg 2006, 24). For these achievements, and more, he was accorded the sobriquet 'the King of Flowers', 'the Northern Pliny'; and for his work on species nomenclature, 'the Second Adam', his authority supplanting the judgement of the father of humankind. Yet common to all these honorific awards, titular counterparts to the wreath hovering over his head in Russell and Opie's print, is a remarkable panegyric and iconographic conservatism in the imagery bodying forth the scientist to his first readers in the eighteenth century. Linnaeus, a man of the Enlightenment, a man pointing forward to Darwin and Huxley, was consistently

2 Musée du Louvre, inv. no. 7300; MR 2339; National Gallery, London, inv. no. NG62.

3 Woburn Abbey, Bedfordshire, UK; Tate Britain, London, inv. no. N00079.

4 Mrs Frances Abingdon (1737-1815), née Fanny Barton, was one of the most notable actresses of the English and Irish repertoire of her age. It was in recognition of her excellence in comic roles that Cosway depicted her as Thalia, Muse of Comedy. Reynolds, who painted her several times, also cast her as Thalia in a portrait of 1764 now at Waddesdon Manor, Buckinghamshire, UK.

5 Concerning Linnaeus, see Malmeström 1964; Blunt 1971; Koerner 1999; Broberg 2006; and Broberg 2019.

Fig. 3. Jan Wandelaar, frontispiece to Carl Linnaeus, *Hortus Cliffordianus*, (Amsterdam, 1737), copper engraving. By kind permission of the Trustees of the British Museum.

lauded in the metaphorics of an old, even ancient, intellectual epistemology. Representations of Linnaeus in pictorial art provide us with an opportunity to gauge how image-makers sought to give expression to the work and achievements of progressive scientists during the Enlightenment. We can approach this problem by considering three works of Linnaeus, two printed in the Netherlands, and the other in Stockholm.

The first is Linnaeus's *Hortus Cliffortianus*, a work of documentation and description of the garden at Hartekamp, outside Haarlem, that belonged to the wealthy banker and amateur botanist, Georg Clifford III (1685-1760) (Blunt 1971, 116-118). Dated 1737, the book is announced by a title-page engraved by Jan Wandelaar, a sophisticated allegorical conceit that flatters both Clifford and Linnaeus, whom the banker had persuaded to reside at Hartekamp between the years 1736-1738 (Fig. 3). Central to the composition is the crowned and sedentary female figure of the Earth holding a pair of keys. In traditional iconography keys would denote the figure of St Peter controlling access to heaven or hell; in this scientific context, the keys open up the kingdoms of fruits and flowers. The Earth sits upon the back of a lion, symbol of the Netherlands, accompanied by its mate lying deep in shadow; the second lion perhaps alludes to the Swedish *lejonet*. Also in shadow is the semi-nude figure of the goddess Diana, recognizable by her attributes of hunting bow and crescent moon upon her brow. She is in darkness because the orderliness of the garden at Hartekamp overshadows her forest domain of wild, disordered nature. More significantly, Diana, as moon goddess, presides over night-time, thus providing a foil for the figure entering the presence of Mother Earth from the right. With his heroic body, crown of laurel, and quiver of arrows, we recognize him as Apollo, the archer god, brother to Diana, and god of the sun. His advent thrusts his sister into the shadows, and he bears a torch to shine light into previously dark places. In so doing, he crushes a dragon underfoot, symbol of the forces of ignorance, but also a reminder of Apollo's identity as Apollo Pytheas, the dragon-slayer. Crucially, Wandelaar provides Apollo with the facial features of Linnaeus himself, an apotheosis of the young scientist from scholar to light-bringing deity. Of course, the conceit implies that his labours in ordering Clifford's garden have brought to light its secrets for the admiration of the world. The character of the collection is indicated by the array of figures surrounding the central action. They consist of three ethnically distinguished personifications, exploiting the figurative stereotypes that make art of the colonial age challenging to digest today. To the left of the Earth is the figure of a woman in a turban, symbolic of Arabia, presenting in tribute a potted shrub of *Coffea arabica*, the coffee plant, that had first grown in Europe in Amsterdam's Botanical Garden, and was subsequently cultivated by Clifford. Next comes Africa bringing a specimen of *Dracaena trifasciata*, or snake plant. Finally, at bottom left is the befeathered type of the Americas, proffering up a specimen of *Hernandia nymphaeifolia*, or lantern tree. Each of these plants has come to Haarlem from far-flung places, a fact alluded to in a detail Wandelaar includes over the head of the Earth and Apollo-Linnaeus. There we see a female figure draping a garland around a garden herm capped with the twin-heads of Janus, Roman god of beginnings and endings. The ancient god doubtless reminds the viewer of the cyclic round of gardens, their rhythms in accordance with the turning year; but these cycles of growth, flowering, and decline take place within the context of eternity, as indicated by the presence of the ouroboros, or snake biting its own tail, carved on the face of the herm. Just as the serpent engirdles the garden's name, so, we are assured, Clifford's efforts will outlast the cycles of time since Linnaeus's description will grant them immortality. This confidence in the future fame of Clifford's garden is underlined by the trees in the background topiaried into obelisks, symbols of enduring fame. In a departure from her usual iconography, in which she wears a chaplet of flowers, Flora is crowned by the prows of ships, accepted iconographic signifiers of naval or navigational success, but here indicating

the transglobal reach of Clifford's collecting mania. The crowning achievement of Clifford's botanical career was his successful cultivation of a banana tree in one of his greenhouses in 1736, the year prior to the publication of Linnaeus's book. The feat is immortalised by the banana tree springing up to the right of the frontispiece, its clusters of fruit rising in priapic triumph. The industry latent in forcing such exotic vegetation to life in cold northerly climes is hinted at in the lower right corner where we see two tutelary genii in front of a watering-can. One wields a spade, but the other tends a crucible leaping with flames, gauging its temperature with a barometer, ciphers for the heating systems Clifford installed in his four glass hothouses.

As we can see from this synopsis of Wandelaar's engraving, the artist deploys an arsenal of Baroque allegorical symbolism, relying upon his educated readers to trace the thread of meaning through the ingenious symbols and emblems that were so much part of the mental furniture of the age. But this visual repertoire was based upon a mindset rooted firmly in Aristotelian-Scholastic tradition, a system of ciphers, signs, and allegories reliant upon authority and a matrix of allusion, metaphor, parallel, and analogy. How different to the mentality developing in the Age of Reason, the Baconian imperative to depend upon evidential reasoning and the primacy of empirical observation. In this, Linnaeus belonged to the new age, and was indeed at the very forefront of such developments. His instinct to observe, define, categorize, and document is already manifest throughout the *Hortus Cliffortiana*, the very work to which this rich allegorical frontispiece was applied.

Apparently better suited in tone to Linnaeus's scientific tenor is the preliminary image of a second book published by Linnaeus in 1737, his *Flora Lapponica*, a published account of the scholar's travels in Lapland, that is, up the east coast of Sweden, west across the mountains to the Norwegian coast, back to the Gulf of Bothnia, down the west coast of Finland, and over to Sweden *via* the Åland Islands. All this was undertaken between May and October 1732, a journey of 1,600 miles through one of Europe's last wildernesses. The arduous detail of Linnaeus's expedition through Lappmark may be found in his *Iter Lapponicum*, the journal he kept throughout his journey, but which remained unpublished until 1811. The *Flora Lapponica* is instead a more disciplined scientific account of the flowers of the Lappish north, a description of over 500 previously undocumented species. But how did Linnaeus's Dutch publisher, Solomon Schouten, advertise Linnaeus's diligent labour? Work on the frontispiece fell to the engraver Adolf van der Laan who takes a very different approach to that of Wandelaar in the imagery of *Hortus Cliffortiana*. The frontispiece offers a landscape of snowy plain, rocky peaks, fir trees, and an icy river (Fig. 4). The staffage of the image takes us far from Claudian classicism: instead, we see reindeer drawing the sleds of the Sami people, the nomadic herders of Lapland, while another Sami carries a canoe over his head. In the near foreground, and again in the distance, we see a *kåta*, or traditional Sami tent, made from the hide of reindeer, an aperture in the roof emitting smoke. A pot inside the near-most tent bubbles away (perhaps boiling reindeer tongues, or a year-old carcass of a capercaillie, Sami foodstuffs eaten by Linnaeus) in readiness for the man seated in the foreground (Blunt 1971, 49). Clad in typical clothing of the Sami, including the *kängor*, heelless and pointed leather shoes and mink-skin hat, short tunic, and playing a *kannus*, or Lappish drum, this figure sits in repose amidst the strange landscape, as content as Adam in Paradise; indeed, the stag seated near to him recalls the iconography of the prelapsarian Eden familiar from Renaissance and Baroque art. But it is with a shock of recognition that we notice the small flower growing to the bottom right, a twinflower, known by its botanical name of *Linnaea borealis*, nomenclature bestowed upon it by Linnaeus himself. Its proximity to the seated figure signals to us that we are not regarding a Sami sitting contentedly by his tent, but none other than Linnaeus himself. Van der Laan shows

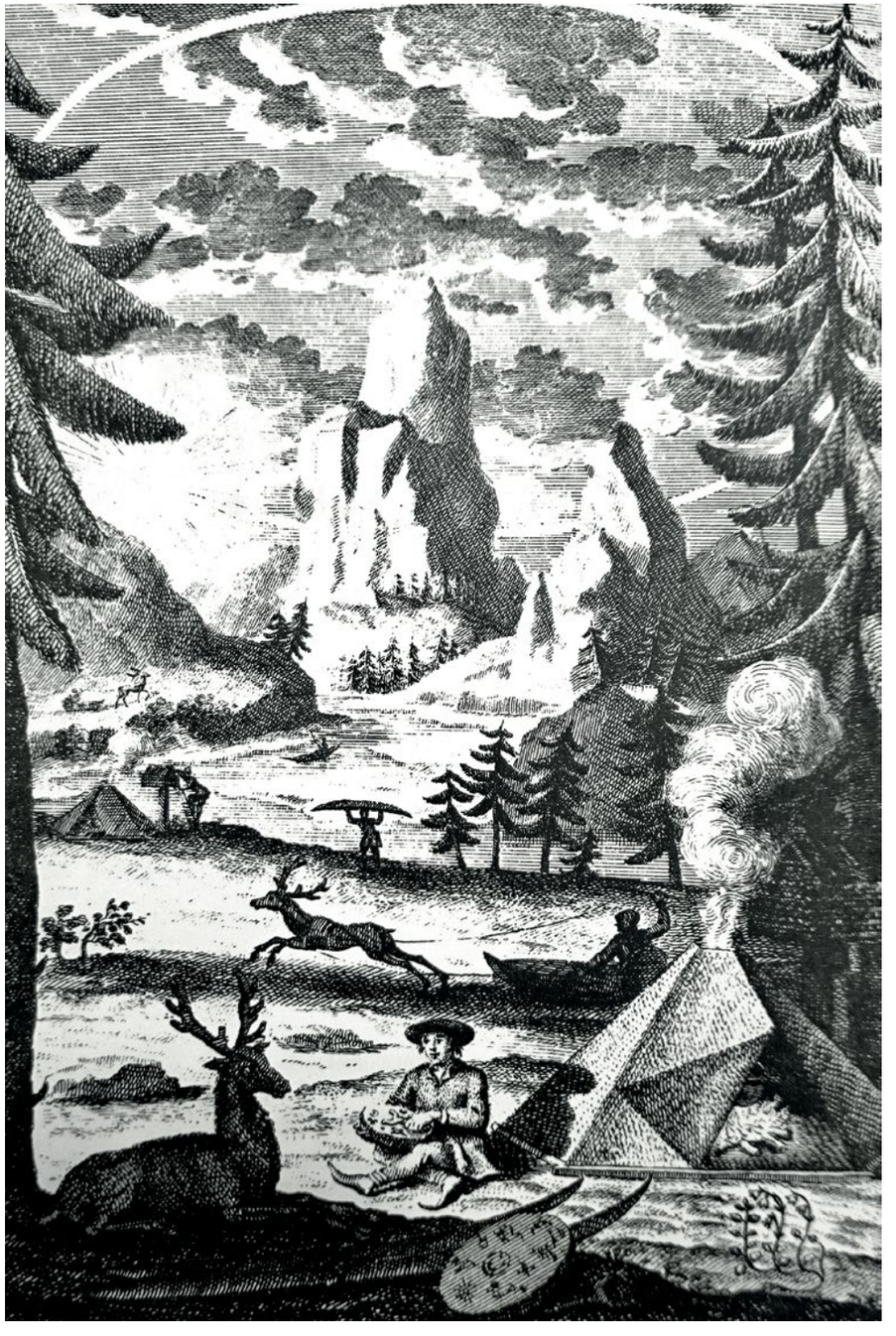

Fig. 4. Adolf van der Laan, frontispiece to Carl Linnaeus, *Flora Lapponica*, (Amsterdam, 1737), copper engraving. By kind permission of the Linnean Society, London.

the hero-scientist enacting his empirical mastery of his field, so steeped and immersed in his subject that he is at one with it. More effectively than rich allegorical language, this new iconography shows Linnaeus as eschewing a *priori* evidence, going instead to the source of knowledge to witness it for himself: it is, in short, the iconography of empiricism. It is certain that Linnaeus encouraged this iconography deliberately. Despite his later reputation as an other-worldly prophet of Nature, Linnaeus was a shrewd careerist who recognized the distinctiveness of his venture into the northerly reaches of Europe, and how his enterprise differentiated him from scholarly rivals in France, the Netherlands, Britain, and Germany. But he was also conscious of competing with the academic heritage of his own country, his position in relation to the great figures of the past who had previously surveyed the Lappish North.

The best known of these internationally was the Strasbourg-born professor, Johannes Schefferus, who had held the Skyttean Chair of Rhetoric at Uppsala from 1648 until his death in 1679. In 1673 he published his *Lapponia*, generally regarded as a pioneering work of ecological and ethnographical description, the first to focus upon one indigenous people.[6] Yet despite its authority and reputation, *Lapponia* had been entirely written from the comfort of Schefferus's study in Uppsala, the great man having not ventured to visit the land or people he so assuredly described. His confidence came from the knowledge that he had scoured the ancient and later authorities for all mention of *Ultima Thule*, an exercise in scholastic retrieval, but a methodology under threat from Baconian, Cartesian, and Lockean *praxes*. By depicting Linnaeus not just manifestly present in and amongst the Sami people, but to have become so at one with them as to sit by a tent in Sami garb, was to establish superiority and pre-eminence over his great predecessor at Uppsala (Koerner 1999, 62).

But there is no doubt that Linnaeus wished to supersede the achievement of another Uppsala professor who was known for his expertise in Lappish customs, and this professor presented more of a threat to Linnaeus's sense of his own uniqueness. Linnaeus's one-time teacher at the university had been Olof Rudbeck the Younger (1660-1740), son of the great polymath Olof Rudbeck the Elder who had published the famous *Atlantica*, in which he propounded the Great Gothic paradigm to the scholarly world, between 1679 and 1702. Rudbeck the Younger had followed his father's interests in the natural sciences, and was indeed co-partner with his father on the boundless project *Campus Elysii* ('The Elysian Fields') that aimed no lower than to list and illustrate every known plant. But before this, in May 1695, Rudbeck the Younger embarked upon one of the most celebrated expeditions in the history of Swedish science, his tour into the northernmost reaches of the kingdom, beyond the Arctic Circle, and into the region inhabited by the Sami. This venture, sponsored by the king, had as its principal aim a study of the midnight sun, but Rudbeck took the opportunity to take in wider aspects of Hyperborean *naturalia* and ethnography. His description of the journey appeared in 1701 in his *Nora Samolad sive Laponia illustrata*, the first of twelve projected volumes to be published in bilingual Latin-Swedish editions.[7] Alas, the devastating fire that ravaged Uppsala in May 1702 consumed many copies of this first part, along with the manuscripts for all the subsequent volumes. Of interest to us is the engraved title-page executed by Anders Holtzbom who had accompanied Rudbeck on his journey to the north (Fig. 5). The viewer looks through a naturally formed arch of rock at the midnight sun hanging low over the horizon of northern meadows. The Sami are seen going about their lives of reindeer herding, sledging, walking on skis, and dancing in a circle outside their tents; some kneel before a shaman performing a ritual invoking the sun. In all, the arcadian scene recalls Virgilian ideals of pastoral ease and innocence, albeit in

6 Schefferus 1673.
7 Rudbeck 1701.

Fig. 5. Anders Holtzbom, frontispiece to Olof Rudbeck the Younger, *Nora Samolad, sive Laponia illustrata* (Uppsala, 1701), copper engraving. By kind permission of Uppsala University Library.

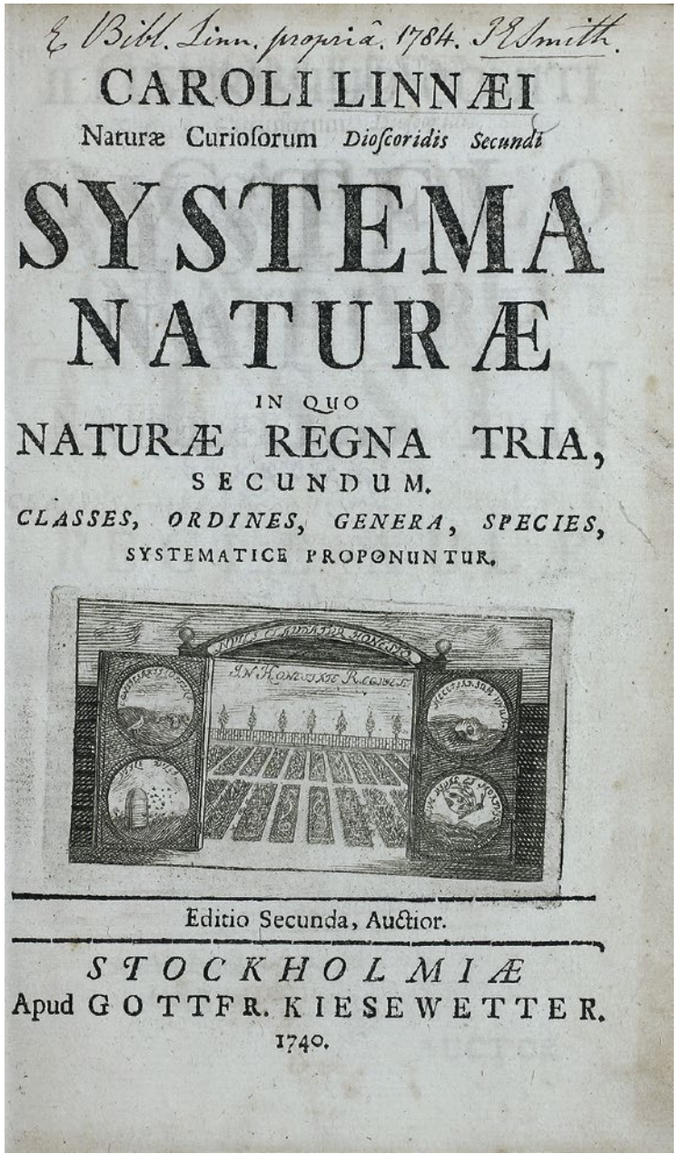

Fig. 6. Title-page of Carl Linnaeus, *Systema naturae*, 2nd ed., Stockholm, 1740. By kind permission of the Linnean Society, London.

exotic Lappish costumes and customs. Standing at one side of the arch is a figure dressed in contemporary Swedish cravat, cloak, tricorn hat, and riding boots, his clothes highlighting his incongruity with the setting. This is Rudbeck the Younger himself in conversation with a fur-clad Laplander. For the first time in Swedish epistemology, we meet with the figure of the explorer-hero, and it is here that we find the prototype Linnaeus was to follow on the title-page to *Flora Lapponica*.

In semiotic terms, Holtzbom's frontispiece intimates that those who wish to know something of this mysterious land must come to it through the words of Rudbeck; the professor stands as an interlocutor between the familiar and the other, at the liminal point between the world of Western European manners and mores, and the hinterland, physical, psychological, and social, of the Arctic North. From a post-colonial perspective, we notice how the representation seeks to express the Swede's natural authority over the native people around him. But the diverse aims of Rudbeck's expedition, partly scientific, partly nationalist and patriotic, is reflected in the emblems dotted around the image. In summary, they assert that the pursuit of knowledge includes imposing Lutheran doctrine upon the pagan Sami; hence one emblem uses a text from Isaiah: 'Folket som i mörkret wandrar, ser ett stort Lius' ('The people that walked in darkness have seen a great light').[8] From this we can see the twin aims of Rudbeck's famous journey north; while its central business has been to accumulate knowledge of the marvels of nature, it has also been an enterprise in internal colonization.[9] As the motto at the top of the plate declares, Rudbeck's journey has been undertaken not just for love of knowledge, but for 'Deo Et Regi'.

By the time Linnaeus published *Systema naturae* in 1740, the work in which he first advanced his theory of binomial nomenclature, it was clear that his remarkable developments in the field of botany had created new territory within science, and that the author need fear no rivalry with his famous Uppsala predecessors. The last of our title-pages, that of the second, expanded edition of *Systema naturae*, published in Stockholm in 1740, differs from the other examples we have surveyed (Fig. 6).[10] It consists of a letterpress title with an engraved plate, somewhat resembling a large printer's device. In it, we see doors opening onto a neatly plotted garden, thought by some to represent Linnaeus's own *Horti Upsaliensis*. An inscription over the entrance declares 'Nulli Claudatur Honesto' ('Let it not be closed to the honest'), while a secondary *lemma* invites the reader to 'In Honestate Requies' ('Repose in honesty'). The moral benefits of botanical study are emphasized, with its promise of an *otium* achieved without vice through contemplation of God's handiwork. Linnaeus's central metaphor is drawn from the sphere of horticulture, and has emblems set in roundels on the insides of the doors referring more widely to other realms of nature – to birds, reptiles, molluscs, and insects, those organisms treated in the taxonomies that follow. Hence, the emblems depict a dove confronting a serpent; a beehive; a pearl within an oyster; and a butterfly emerging from a chrysalis. The top left emblem of the dove and serpent is inscribed 'Consiliarii Ossimi' ('Ostian Councillors' – possibly a reference to the *Ostiaei*, a northerly tribe described in an account of Pytheas's journey among the northern peoples in the 3rd century BC); the pairing of the creatures suggests the two sides of nature, innocence and guile. The lower left emblem of the beehive has the motto 'Utile Dulci' ('Useful and sweet'); the top right emblem of the oyster and pearl carries the *lemma* 'Necessarium Unum' ('One things is needful' – a play on St Luke 10, 42); and the lower right image of a butterfly and chrysalis is glossed 'Cum Vivis Et Mortuis' ('As with life so with death'). Certain of these

8 Isaiah 9, 2.
9 Ellenius 2003, pp. 9-31.
10 Linnaeus 1740.

emblem-complexes derive from older iconographical tradition, but in their new context lose their inherited moral meaning. We are perhaps invited to share in an optimistic view of God's created order, as neatly arrayed as the symmetrical flowerbeds laid out before us, and extended out to all corners of nature, on land, sea, or air. The clarity of the *modo Linnaeana* sought to refine and fix the definitions of the plenitude of species under his survey; the categorization of flowers, herbs, trees, birds, mammals, fish, *et al*, into phyla, order, genera, and species, *etc*., aimed to arrive at the essential identity of each, a system of nature that dispensed with earlier endeavours to categorize and differentiate through anecdotal observations of behaviours, traits, and character garnered from the lore of fable, bestiary, or ancient authority. Linnaeus's creed was expressed as 'Res ipsas nosce,' that is 'To know the thing itself', working from empirical observation, not the miasma of received opinion. The worldwide fame of his endeavours, and its reach beyond the scientific salons and into the drawing rooms and schoolrooms of Europe, contributed much to the dismantling of an older, rationalistic, scholastic, and emblematic worldview. And yet the decline of the pre-modern paradigm was to be slow and protracted, as we witness when we return to the engraving from 1806 with which we began.

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GENESIS AND SHAPE OF THE BELGIAN PILGRIMAGE SHRINE "ONZE-LIEVE-VROUW" IN SCHERPENHEUVEL: NEW INSIGHTS THROUGH INTERDISCIPLINARY COMBINATION OF METHODS

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ABSTRACT
In the early seventeenth century, the Spanish regents Albert and Isabella created an extraordinary heptagonal Pilgrimage ensemble in Scherpenheuvel (Flemish Brabant). This paper gives an insight into an interdisciplinary research project concerning this building ensemble that is currently being conducted at RWTH Aachen University. The research project aims to analyse and interpret the genesis, form, and programme of Scherpenheuvel considering its three levels of scale and artistic media: the ideal city plan, the centrally planned church building, and the church's multi-layered artistic decoration consisting of three concentrically arranged iconographic programmes. For the first time, the ensemble is documented and examined employing the methods of building archaeology. An accurate as-built survey serves as a basis for identifying the different design and construction phases of the church building and the city layout. The goal is to find out what the original archducal project looked like and how it was modified and reinterpreted in different phases of development. Simultaneously, the written sources and scientific literature concerning the building ensemble are compiled, analysed, and interpreted. The iconographic programmes are being examined from an art historical perspective. Thus, microscopic and macroscopic approaches are combined in order to gain a comprehensive understanding of the pilgrimage site regarding its building chronology, typology, use, and iconology as well as political and religious purposes.
Keywords: *building archaeology, art history, Pilgrimage architecture, Southern Netherlands, Albert and Isabella*

AN INTERDISCIPLINARY RESEARCH PROJECT ACROSS THREE LEVELS OF SCALE

The Marian pilgrimage site of Scherpenheuvel/Montaigu is an idiosyncratic architectural ensemble and a unique example of early 17th century sacred architecture in the southern Netherlands. The ensemble is built concentrically within a heptagonal ground plan around the domed pilgrimage shrine Onze-Lieve-Vrouw (fig. 1). The shrine houses a miraculous image of the Virgin to which mysterious healing miracles have been attributed since the late Middle Ages. The heptagonal church building does not rise freely, but is framed by two other components: a massive tower to the east and a portico to the west, whose façade is reminiscent of Roman church façades of the 16th and early 17th centuries.

The pilgrimage ensemble was founded by the Spanish Archduke Albert VII of Austria and Infanta Isabella Clara Eugenia, to whom the Spanish King Philipp II had ceded sovereign regency over the Netherlands in 1599. In the midst of the "Eighty Years' War" – the Dutch War of Independence against Spain – the ruling couple had their court architect Wenceslas

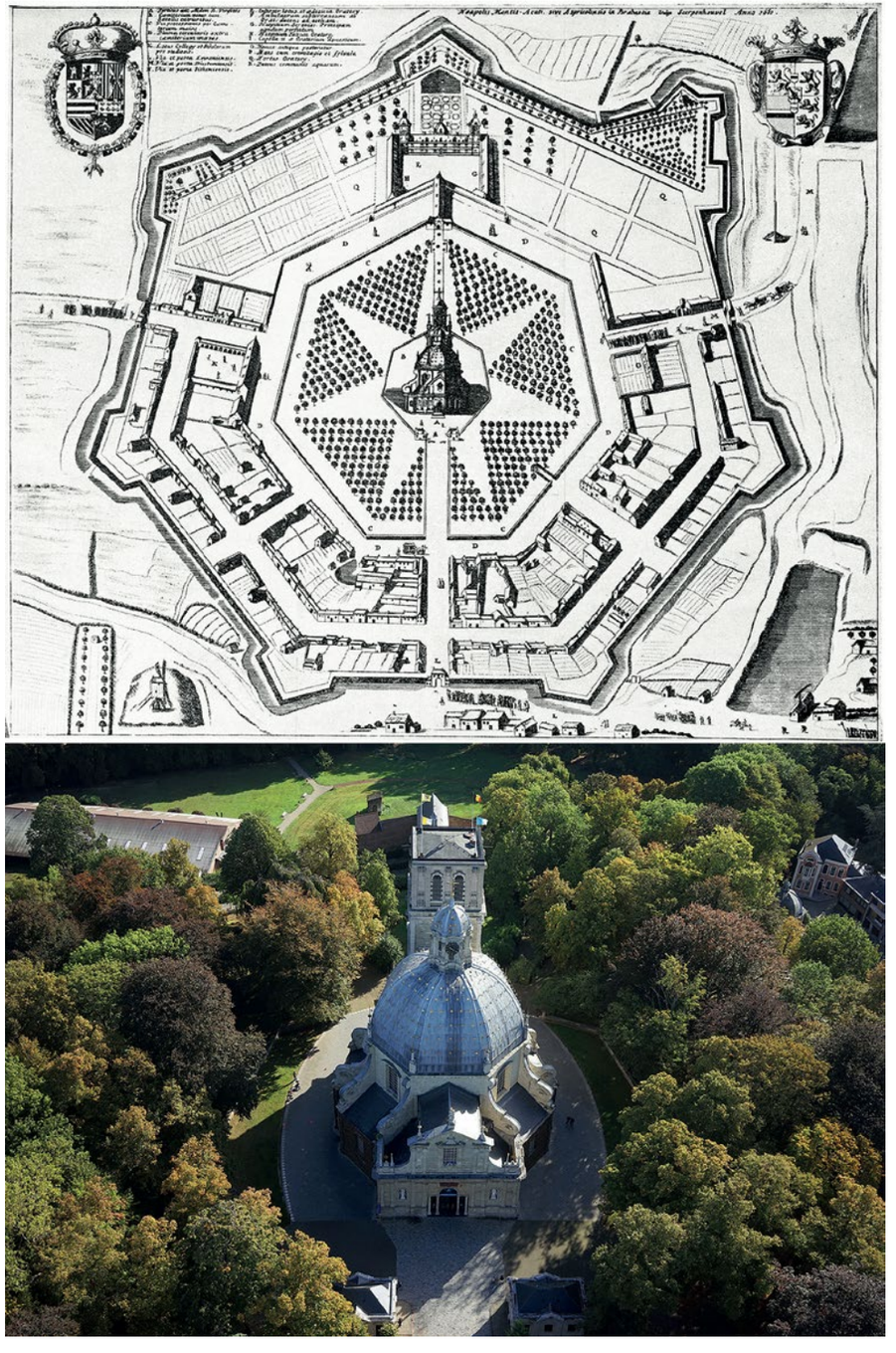

Fig. 1. Ground plan of Scherpenheuvel, 1661, engraving by Conrad Lauwers (Sanderus, A. (1735) Chorographia Asperi Collis, 9v–10r. fol. from: Boni 1953, Plate XIII

Cobergher (1557/61–1634) gradually monumentalise the pilgrimage site from 1603/04 onwards, in order to symbolically restage it as a place of collective healing and salvation for their war-torn dominion (Boni 1953; Lantin 1971; Duerloo, Wingens 2002; Lombaerde 2014; Naujokat 2017, Naujokat 2021).

In order to understand more precisely the architectural form and programme of this extraordinary ensemble in its successive phases of development, we have combined various sources and research approaches in an interdisciplinary monographic research project. In addition to the written tradition and archival evidence, we also systematically include the building itself as a historical source for the first time. In order to analyse and interpret the three levels of scale and genres of art – the ideal city, church architecture, and its iconographic programmes (paintings, sculptures, reliefs) – our approach incorporates research questions and methods from building archaeology and history of architecture with those from art history.

In this way, we were able to roughly identify two project phases for the construction period under the archdukes in the early 17th century. These are, on the one hand, a 'concentric original project' that focused all components on the miraculous image in the centre, and, on the other hand, a phase of subsequent reinterpretation of the original project starting from around 1617/18 onwards. Increasing emphasis was now given to the east-west axis, overriding the initial strictly concentric concept. The domed church building was complemented by various components staggered one behind the other: the western façade, the towering high altar, the bell tower, and the monastery building at the foot of the eponymous 'sharp hill', on the top of which the church building is located.

THE ICONOGRAPHIC PROGRAMME OF THE PILGRIMAGE CHURCH: THREE LAYERS AND THREE ARTISTIC MEDIA

The particular art historical significance of the Scherpenheuvel pilgrimage church derives from how the various levels of scale of urban planning, architecture and iconographic programmes in three artistic media are intertwined into an overall symbolic concept. The church's iconographic programme forms three layers that are grouped around the miraculous statue of the Virgin on the main altar, and thus follow the concentric logic of the ensemble as a whole. All three layers have survived in situ to the present day, each of them being dedicated to a different artistic medium (fig. 2).

The innermost layer is formed by six life-size marble statues of prophets produced by Robert de Nole c. 1622 (Banz 2000, 106–116; Duerloo, Wingens 2002, 164–170; Lenhart 2021, 239–246). They are installed inside the corner recesses of the domed hall. The second layer is formed by six large-scale altarpieces painted by Theodoor van Loon (Duerloo, Wingens 2002, 133–145; Janssens 2005; Duerloo 2008, 423–439; Van Sprang 2018, 19–34; Lenhart 2021, 247–270). They are mounted above the altars of the side chapels. The third layer is formed by bas-reliefs cut in limestone that are placed on the altars of the four outer chapels (Banz 2000, 107; Duerloo, Wingens 2002, 167–169).

In what follows, we focus on the placing of the altar pieces painted by Theodoor van Loon between 1616 and 1621. They show scenes from the life of the Virgin, based on the Golden Legend by Jacopo de Voragine. Today, the cycle starts in the southwest chapel with the *Meeting at the Golden Gate*, being followed by the *Nativity of Mary* in the south chapel and the *Presentation of Mary* in the southeast chapel. Having passed behind the high altar, the itinerary continues with the *Annunciation to the Virgin Mary* in the northeast chapel, proceeding to the *Visitation of Mary* in the east chapel, and ending in the northwest chapel with the *Presentation of Jesus at the Temple*. Cartouches with inscriptions at the top of each

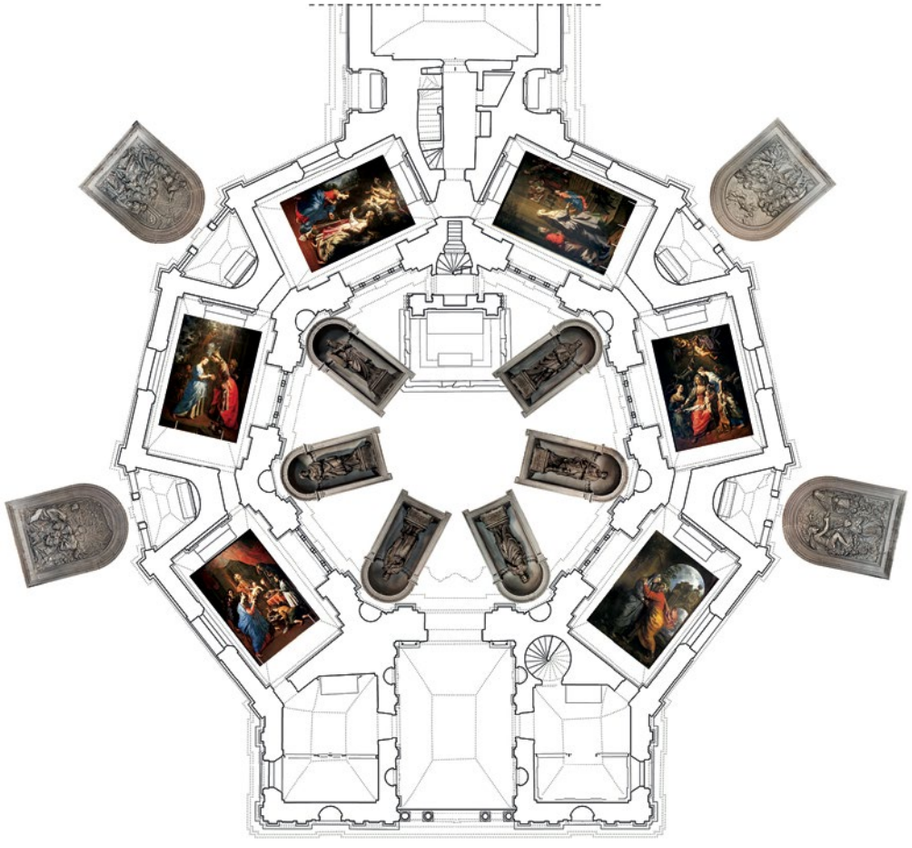

Fig. 2. The three concentric layers of the iconographic programme in the pilgrimage church of Scherpenheuvel in their actual arrangement. ©Lehrstuhl für Architekturgeschichte, RWTH Aachen University (Anke Naujokat, Christian Klosterkötter).

altar frame contain short Biblical quotations that presumably refer to the episode depicted in the painting below. But their relation to the paintings is obscure because the situation of the altar pieces today does not conform with their original arrangement. A pilgrimage pennant from 1651 with a woodcut by Jan Christoffel Jeghers shows a cross section of the domed central hall of the church (Duerloo, Wingens 2002, 67). This image is an iconographic proof that the painting representing the *Annunciation* was situated in the north chapel, and the place of the *Presentation of the Virgin Mary* at the Temple was in the south chapel. The woodcut also shows the high altar with the miraculous image situated in a niche at the top of the altar, and the statues of the prophets *Moses* and *David* in their niches at the corner recesses of the domed central hall. We were lucky to find an archival proof for the rearrangement of the altar pieces in the diaries of pastor Jan Frans Pallemaerts, who describes how in 1934 he had five altarpieces rehung to ensure a smoother flow of pilgrims inside the church (Pallemaerts 1926–1935, fol. 104f.). Since then, pilgrims can visit the episodes of Mary's life in their narrative order following a counter-clockwise circuit of the side chapels, and using the narrow passages previously reserved for the priests. In its actual state the circuit

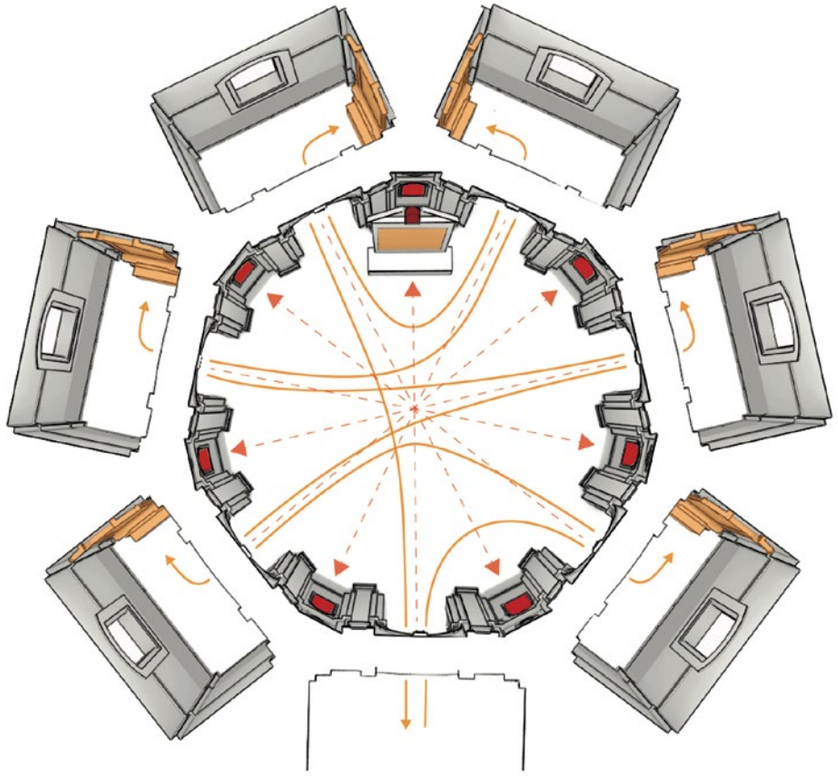

Fig. 3. Reconstruction of the star-shaped itinerary of stations in the heptagonal pilgrimage church with lines of motion and visual axes. ©Lehrstuhl für Architekturgeschichte, RWTH Aachen University (Christian Klosterkötter, Anke Naujokat)

of stations is spatially separated from the domed hall and there is no interaction between the altarpieces and the miraculous image on the high altar.

Prior to Pallemaerts's changes, the route of the pilgrims was fundamentally different. According to his records, the pilgrims "had to constantly traverse the basilica in order to visit the depictions in the right order" because the altarpieces were alternately hanging in the southern and northern side chapels (Pallemaerts 1934, fol. 104f.). Their itinerary would thus have described a star-shaped zigzag path, for which they would have to repeatedly cross the domed central hall. In doing so they carried out a continuous performative interaction between the surrounding "narrative images" in the chapels and the sacred image on the main altar which they were steadily approaching in the course of their movement. The reconstruction of the original altar arrangement has already been a subject of research. Luc Duerloo and Marc Wingens were the first scholars to relate the paintings to the inscriptions on the altar cartouches as well as to the saints to whom the altars are dedicated, and they have suggested that the altar paintings facing each other in the north and south constitute thematically related pairs. However, their attempt at reconstruction was made without

knowledge of Pallemaerts' notes and paid no attention to the obvious relationship of the pictorial spaces to the spatial situation of the pilgrimage church (Duerloo, Wingens, 132–144). Our research question aims precisely at the spatial situation and the interconnection of the various pictorial programmes within the church space in order to find out how the statues of the prophets relate to the paintings in the lateral chapels and the central hall. A combination of the methods of art history, architectural history, building archaeology, and archival research, has enabled us to solve the problem of the original arrangement of the altars (fig. 3).

Van Loon's altarpieces unfurl their narrative with great immediacy and intensity to the pilgrims as they were conceived in close dialogue with the unusual spatial structure of the heptagonal church building. The pictorial spaces are composed as if extensions of the real space, taking into account that pilgrims would always enter the side chapels from the central hall. By comparing the light situation of the real space with the light situation within the paintings, we found out how the incidence of natural light through the chapel windows matches the light within the paintings. By leaving the lateral chapel, the pilgrim's gaze is directed across the central hall towards the statue of a prophet standing on a plinth bearing an inscription (fig. 4). The six prophet statues made by Robert de Nole are *Moses, David, Isaiah, Jeremiah, Ezekiel*, and *Daniel*. By connecting the inscriptions and comparing them to the representations on the paintings, it became clear to us that each prophet steers the pilgrim towards the next station of the Marian cycle by the prophecy inscribed on his plinth.

For instance, on leaving the first chapel with the Meeting at the Golden Gate, the pilgrims face *Moses* (fig. 5). The inscription on his plinth is: A STAR RISES IN JACOB, | A SCEPTRE RISES IN ISRAEL (Numbers 24, 17). The prophecy of Moses from the Book of Numbers is to be understood as an announcement of the birth of Mary, who is a descendant of Jacob. The birth of the virgin Mary is represented today on the altar of the south chapel. But in the original arrangement its place was in the northwest chapel, where the pilgrim would head next. The inscription on the altar frame in the northwest chapel is: CANDELABRUM AUREUM (Exodus 25). This Biblical quotation refers to the making of the golden, seven-branched candelabrum. It can be understood in relation both to Christ himself as the light of the world, as well as to the Virgin Mary, since it is she who, having delivered Christ, brought the light of the world to humanity. In this manner, the nativity of Mary as the bearer of Christ is set in perspective with Christ as the Saviour of humankind. Furthermore, the light in the painting coming from the left-hand side conforms with the natural light coming in through the window in the northwest chapel.

In our reconstruction of the original setting, the altar paintings combined with the quotations from the Bible on the frames can generally be interpreted as the fulfilment of the preceding prophecy. The combination of texts and images resembles the structure of *lemma* and *pictura* in the emblem books of the early 17th century and in this way stimulates a coherent reading of the sculptures and paintings during the procession along the pilgrimage route. The iconography of the paintings is based on familiar patterns. The spatial disposition, the incidence of light, and the figures, which seem to have sprung from the immediate everyday world, offer the pilgrims the possibility of immersing themselves in the story of salvation and feeling like participants in it. At the same time the prophets establish a dialogue between the "narrative" paintings and the miraculous cult image by repeatedly steering the pilgrims' gaze to the main altar as they cross the central hall. Their prophecies can thus be related to both the Marian stations and the miraculous image, further connecting the very different kinds of images. The complexity of the image programme and the connection of sculptures and paintings can be revealed by using the methods of iconography and iconology (Warburg 1998 [1912]; Panofsky 1998 [1932]). The spatial arrangement and the

Fig. 4. The Prophet Moses in the corner pillar facing the opening of the chapel with the *Meeting at the Golden Gate*. ©Lehrstuhl für Architekturgeschichte, RWTH Aachen University (Felix Mayer)

Fig. 5. Theodoor van Loon, *The Meeting at the Golden Gate*, 1616, oil/canvas, c. 257 x 180 cm, altar frame attributed to Robrecht de Nole workshop. Robrecht de Nole, *The Prophet Moses*, 1622/23, marble, height c. 200 cm. ©Lehrstuhl für Architekturgeschichte, RWTH Aachen University (Anina Janich, Tim Scheuer)

combination of different media, such as sculpture, painting, and text, allow for various levels of reception and address groups of pilgrims with different educational horizons. Whereas ordinary people are drawn by the realistic and down-to-earth character of the depictions of Mary's life to engage in empathetic, dialogic contemplation of the scenes and pictured miracles, an educated viewer versed in the interpretation of combined texts and images can read the Marian scenes as books of emblems and progress from the observation of a single image towards a "comparative visual study" of several works at once (Ganz 2000, 341–378; Ganz, Thürlemann 2010; Blum, Thürlemann 2012).

The altarpieces and prophet statues are closely linked to each other by the church's architecture and its heptagonal layout. As the pilgrims proceed around their seven-pointed star-shaped path of stations inside the church, their dynamic perception of images would unleash a complex process of reception in their minds. The images and iconographic programmes combine into a multi-faceted web of configurations and tie the miraculous image into a variety of spatial, devotional, and theological contexts by bringing it to feature both within the circle of Old Testament prophets and at the centre of the star-shaped Marian stational itinerary. On their path of stations through the church, the pilgrims approach the centre of worship: the miraculous statue of Mary on top of the high altar at the east end of

the domed hall. The painting of the Assumption of Mary on the high altar is the culmination of the Marian cycle. It was completed just shortly before the consecration of the church in 1627. In other words, it can be dated considerably later than the six retables in the radiating chapels, which were painted between 1616 and 1621. A possible reason for this delay is that the iconography of the retable of the main altar underwent a programmatic alteration. The change did not affect the entire programme, but only the main altar. This change must be seen in connection with the second building phase of the church that established an east-west axis dominated by the tower and the Italianate façade of the church building, which is closely linked to the iconography of the assumption represented in the altar painting, and to the miraculous image.

These important findings would not have been possible without the new insights into the two construction phases of the building ensemble that we gained through careful documentation and investigation of the building itself. Therefore, in the following part of this article, we would like to give a brief insight into the methods of building archaeology and measured building survey that we used in our project.

SOME REMARKS ON THE PRACTICAL METHODS OF BUILDING ARCHAEOLOGY AND MEASURED BUILDING SURVEY APPLIED IN THE PROJECT

The building itself in its current condition is one of our main sources for researching the chronology of its construction and the history of its design. Our investigation includes the examination of the building structure, its different parts and their density, as well as their structural connections and disconnections. The examined features of the building – among others – give us clues as to whether there have been changes to the building fabric due to human or natural influences, and thus help us to gain an understanding of the different phases of construction and design.

In order to be able to view and analyse the ensemble in its entirety and to visualise the different building phases, we conducted an as-built survey using various digital surveying methods. The holistic approach of the research project required that we consider different scale levels, taking into account the urban scale, the scale of the building, as well as the scale of the individual architectural elements and details (fig. 6).

A very accurate survey of the volumetric structure and the main layout of the buildings was first carried out on site with the help of a Total Station (or Tacheometer). Where necessary, this rather rough digital model was then refined in a second step with the help of true-to-scale point clouds and orthophotos using the photogrammetric method called *Structure from Motion* (SfM). To do this, thousands of photos – some taken by a drone at the upper parts of the building – were compiled into a three-dimensional textured model using Agisoft Metashape software. The particular methods were chosen according to the respective research questions that we aimed to address at the single parts of the building (fig. 7).

All surveying methods have their advantages and disadvantages, which we took into account when we consciously combined them. Working with *Structure from Motion* or laser scanning allows faster data collection on site with subsequent post-processing and evaluation at the office. These methods are especially well suited for details that cannot be surveyed with a total station without an immense expenditure of time. Furthermore, they enable us to document not only the structure of the building but also its different material surfaces. Despite their advantages, both methods have the crucial disadvantage that the collected data

Fig. 6. Collage of the different scale levels: Urban cross-section (bottom), Cross section of the central building (left), north façade of the Lantern (right). ©Lehrstuhl für Architekturgeschichte, RWTH Aachen University (Anke Naujokat, Survey Team) Lehrstuhl für Architekturgeschichte, RWTH Aachen University (Anina Janich, Tim Scheuer)

fig. 7: Orthophotograph of the west façade. ©Lehrstuhl für Architekturgeschichte, RWTH Aachen University (Anke Naujokat, Survey Team)

sets are often evaluated and interpretated separately from the physical building. In order to counteract this disadvantage and also to be able to evaluate the collected data with regard to their reliability, we founded our survey on a 'conservative' Tacheometric survey. This method is definitely more time consuming on site, but it is well suited to form the foundation for the interpretation of all collected data that are evaluated later ex situ at the office.

CONCLUSION

The combination of different methods and technologies with different methodologies rooted in the respective disciplinary cultures of architectural archaeology, architectural history, and art history yielded positive results in the correct assessment and reconstruction of the complex structural system of the Scherpenheuvel pilgrimage site with regard to its original architecture and pictorial programmes.

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THE CAREER OF "LATVIAN" COUNT MICHAŁ JAN BORCH AT THE CONVERGENCE OF THE HUMANITIES AND NATURAL SCIENCES[1]

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ABSTRACT.
This paper frames questions of the synergy between the humanities and natural sciences in Latvian cultural and historical perspective through a case study exploring the career of Count Michał Jan Borch (1753-1811). Born in the present-day region of Latgale in eastern Latvia and well-travelled across Europe, Borch was admitted to at least seventeen French and Italian academies for his poetry, travel literature, and wide-ranging works in the natural sciences. This essay re-considers Borch's scientific publications on mineralogy (with particular focus on mining sciences), mycology, volcanology, and geobotany. I argue, on one level, that his construction of knowledge was focused across seemingly unrelated fields of science that were, in fact, linked by the fact that all explored correlations between external visible and internal invisible phenomena. On another level, I make a case for the direct connection between Borch's scientific works and his humanistic production in literature, poetry, and the visual arts, as well as his career ambitions as diplomat and courtier. In these socio-political realms, outward performance of the inner self played a crucial role. I thus make a case for the ways in which Borch's scientific works offered him a means to think through socio-cultural issues critical to his humanistic courtly activities, entangling his "scientific" and "humanistic" selves.
Keywords: *Latgale, Polish Livonia, Enlightenment*

Around the age of twenty-five, Count Michał Jan Borch had his portrait painted ca. 1778 by the Austrian-born artist Ludwig Guttenbrunn (Busiri Vici 1976). The background setting, the bay of Naples, places Borch in Italy, where he spent the last five years of an eight-year Grand Tour of Europe, which he began in 1774. He had travelled to Naples through Austria, Switzerland, and France (Biliński 1977, Taimiņa 2013, Noyes 2021). Borch was born on his family's estate in Varakļāni (Pol. Warkland) (Strods et al. 2003). At the time, Varakļāni was located in the historical territory of Inflanty Voivodeship (Polish: Województwo inflanckie), also known as Polish Livonia or Inflanty, a geographic area corresponding to present-day

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Fig. 1. Ludwig Guttenbrunn, Portrait of Michał Borch. Oil on board, c. 1778. Moscow, Tretyakov Gallery.

Latgale in eastern Latvia, which both today and during Borch's time marked the convergence of Europe and the West and Russia and the East (Zajas 2013).

The young count, descended from earlier generations of Baltic German nobility, was the eldest son of the Lithuanian Grand Chancellor and later Crown Chancellor of the Polish-Lithuanian Commonwealth; he became the son-in-law of the Governor General of Livonia (Turkowski 1936). Although Michał's family ranked amongst the upper echelons of the Polish-Lithuanian nobility, his departure for his Grand Tour and the start of his career coincided with the reversal of his family's fortunes. This came in the aftermath of the forcible integration of their vast land estates, concentrated in Polish Livonia, into the Russian empire, in the first of the Partitions of Poland-Lithuania (1772, 1792, 1795). These territorial divisions perpetrated by Russia, Prussia, and Austria progressively fractured the

count's homeland until the Commonwealth ceased to exist, thus having a serious impact on Borch's socio-political and career prospects (Lukowski 2014, Dybaś et al. 2018).

As early as 1770, Russian soldiers had plundered the Borch family estates around their primary manor at Varakļāni. The imperial troops pillaged valuable furniture, libraries, and other goods, which the Borch struggled to have returned or repaid in the following years (Noyes 2021, 11). Michał Jan Borch's Grand Tour was thus in a sense a means of escape from his homeland, as well as an unofficial diplomatic mission on its behalf, as much as it was an education (Jeziorski 2017). Admitted to at least seventeen French and Italian learned academies during his travels, the young count divided much of his five years in Italy between the papal court in Rome and the Habsburg-Bourbon court in Naples (Zgórniak 1994). In these court settings, he petitioned on behalf of Poland's sovereignty, and aimed to distinguish himself as a Polish noble possessing wide-ranging talents and expertise, and to this end he maintained learned correspondence with some leading scientific, philosophical, artistic, and literary figures of the period (Stroev 2014, Kļaviņš 2013). Borch was, on the one hand, a poet in multiple languages and amateur artist, architect, and landscape architect, as well as a patron and collector of art and antiquities (Abramowicz 1984, Spārītis 1998 & 2020, Strupule 2011, Polanowska 2012 & 2013, Zilgalvis 2013, Rączka-Jeziorska 2016, Borch 2019a-b, Grudule 2020, Noyes 2021). On the other hand, he was also an amateur scientist and author of wide-ranging works in the natural sciences (Gaweł 1966, Maślankiewicz 1968, Stradiņš 1980, Siemion, Szastyńska-Siemion 2013 & 2015).

Borch pursued all of these activities over the course of his overarching career as an international courtier, an occupation which was itself historically consistent with the paradigm of the Renaissance Man well-versed in humanistic and scientific studies (Burke 1996). Framed around a detailed exploration of his portrait by Ludwig Guttenbrunn as an example of the count's courtly and intellectual self-fashioning, this essay frames questions of the synergy between the humanities and natural sciences in Latvian cultural and historical perspective through a case study drawing on a range of source materials. I argue, on one level, that Borch's construction of scientific knowledge was focused across seemingly disparate fields that were, in fact, linked by common concerns. On another level, I link these concerns to his career as courtier across cultures and throughout his lifetime.

Guttenbrunn captured the pinnacle and turning point in Borch's travels and career, when the count's courtly ambitions were at their highest point. In letters to his father and the Polish king, he claimed to enjoy a very favorable position at the Naples court as friend and protégé of the new Prime Minister, and he hinted that he was a favorite and possibly a lover of Queen Maria Carolina of Austria (sister of Queen Marie Antoinette of France), the de facto ruler of the Kingdoms of Naples and Sicily (Noyes 2021, 29-30). Given what Borch viewed to be his very promising situation, he anticipated an illustrious diplomatic career in Italy, and requested that the King of Poland make him Plenipotentiary Minister for Poland to the Kingdoms of Naples and Sicily (Ibid.).

Guttenbrunn's portrait depicts the defining features of his hoped-for career, in terms of Borch's synergetic approach to patronage and knowledge production in the sciences and humanities, in the service of a courtly agenda. Michał likely conferred with the painter regarding the composition, which presented the young nobleman as an erudite Enlightenment courtier surrounded by the material culture of his intellectual landscape. The Neapolitan landscape in the background is marked by the smoking Vesuvius volcano. This setting recalled his scholarly interest in volcanology. He sits in a relaxed pose at a stone inlay table composed of square tiles of vividly colored marble and other hardstones, manufactured using either the technique of pietre dure (actual panels of cut stone) or the method of scagliola (imitation marble) (Mitrulevičiūtė 2015). The opulent table signals his mineralogical interests. Borch

would later acquire similar intarsia tables for his Varakļāni estate; for example, in 1802 he bought a scagliola table in St. Petersburg for 250 rubles (Noyes 2021, 26). Two examples of scagliola tables from his dispersed collections have reportedly survived from his dispersed collections in Latvian museums today (Taimiņa 2013, 14).

His left arm rests on a stack of scientific volumes that he himself authored, shown here left to right: Sicilian Lythography and Sicilian Lythology, both works on mineralogy aimed at elite collectors of stones like Borch himself, with a third book Theories on Volcanoes planned but never published (Borch 1777 & 1778a-b, Stradinš 1980). In 1780, Michal published a related work, Sicilian Minerology, with a particular focus on the study of rocks and minerals in relation to mining sciences (Borch 1780a). His left hand rests beside a piece of glittering Sicilian iron pyrite. This yellow mineral with a metallic luster sometimes mistaken for gold was synonymous in Borch's mineralogical writings with Sicily itself, where pyrite could be found in large quantities very easily (Borch 1777, 48; 1778b, 11; 1780a, 147-149 & 209-210). He associated the plentiful supply of pyrite with the region's many volcanoes. The vase with flowers, like the distant volcanoes, is aligned with Borch's head and perceptive gaze. Both of these motifs function as humanist visual metaphors for the invisible workings of the mind, and gesture to the work of an aspirational courtier diplomat. According to courtly self-fashioning in the Renaissance tradition, one must both present oneself as outwardly beautiful like the flowers, and only judiciously reveal one's inner thoughts and designs as the volcano concealed its inner workings (Greenblatt 1980).

Although the flowers are too generic for precise identification, they may also refer to Borch's works in geobotany. This refers to the scientific field that analyzes certain plants and vegetation as indicators of minerals in the soil (Nowak & Nowak 2022). Geobotany is therefore also related to mineralogy, and more specifically to the locating of minerals and their extraction through mining. This was the subject of a special discourse he presented when he was received by the Academy of Sciences in Dijon, France, titled Mémoire sur l'indication des minéraux par les plantes et Analyse de deux sources ferrugineuses découvertes dans le Forez à la suite du Mémoire sur l'indication des minéraux par les plantes (Report on the indication of minerals by means of plants, and Analysis of the two ferrous sources discovered in the Forest following the Report on the indication of mineral by means of plants) (his manuscript text is preserved in the Czartoryski library in Cracow) (Gaweł 1966). After returning to Poland years later, the count attempted to elevate himself at court by proposing to do further geobotanical research with royal support. The goal, according to Borch, was to undertake the mining of precious Commonwealth salt reserves. However, the king's advisors dismissed his ideas as fanciful (Ibid.). This was long before geobotany became an established scientific field.

Along similar lines, Borch's 1780 publication on mycology (the study of fungi), titled Letters on Piedmont Truffles, included highly naturalistic studies of Piedmontese truffles from the forests of northern Italy (Borch 1780b, Siemion, Latko 2013). Figs. 2-3. These very detailed printed color illustrations were made by the Milanese artist Louis Charles Gautier-Dagoty after the count's own detailed drawings made from observing actual specimens. They were executed by means of a colored printing method called mezzotint, which at the time was a cutting-edge science. Letters on Piedmont Truffles focused on a different kind of mining. It was devoted to the prized underground truffle of northern Italy. Moreover, the work also investigated the inner world of the truffles themselves, which the count explored with a microscope.

Furthermore, he included a section on lepidopterology (the study of moths), and specifically their development in the cocoon. Both the inner workings of the precious truffles, and the otherwise invisible development of the moths inside their cocoon, were illustrated in

Fig. 2. Louis Charles Gautier-Dagoty after Michał Jan Borch, Mezzotint illustration of microscopical studies of truffle fungi. Bottom caption: "Dessiné par l'auteur […] Gravé en couleur par Louis D'agoty" (Drawn by the author [M. J. Borch] […] Engraved in color by Louis D'agoty). Picture caption: "A. Truffe grise dan l'état naturel B. Truffe coupée horizontalement C Truffe coupée verticalement D. Truffe coupée horizontalement vue au Microscope E Truffe coupée verticalement vue au microscope F. Truffe pourrie coupée horizontalement G. Truffe pourrie manifestant sa semence" (A. Grey truffle in its natural state B. Truffle cut horizontally C. Truffle cut vertically D. Truffle cut horizontally viewed with a Microscope E. Truffle cut vertically viewed with a Microscope F. Rotten truffle cut horizontally G. Rotten truffle showing its seeds). In *Letters on Piedmont Truffles*, 1780.

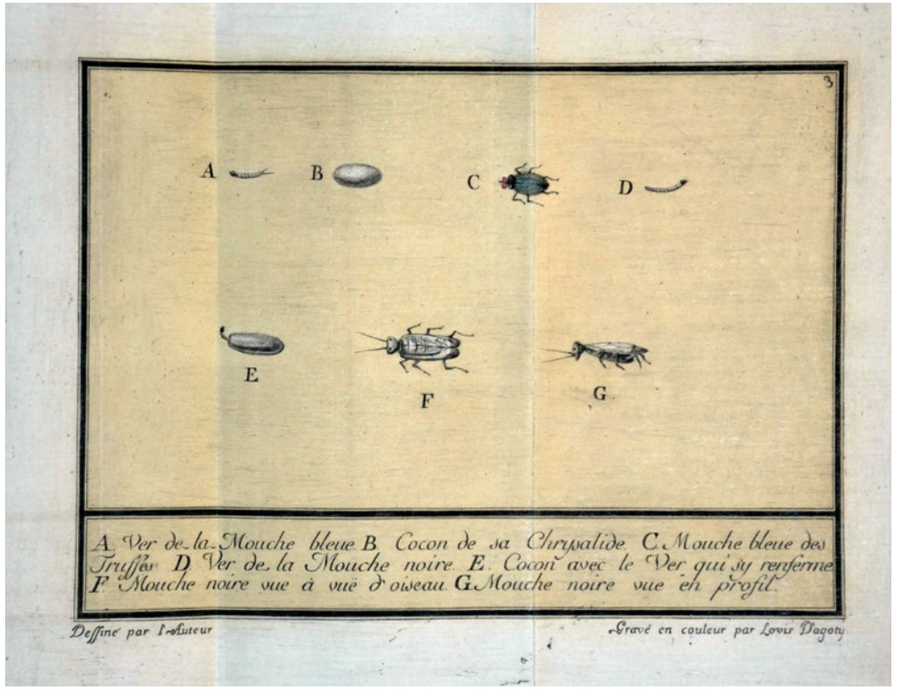

Fig. 3. Louis Charles Gautier-Dagoty after Michał Jan Borch, Mezzotint illustration of moth development. Bottom caption: "Dessiné par l'auteur […] Gravé en couleur par Louis D'agoty" (Drawn by the author [M. J. Borch] […] Engraved in color by Louis D'agoty). Picture caption: "A. Ver de la Mouche bleue. B. Cocon de sa Chrysalide. C. Mouche bleue des Truffes. D. Ver de le Mouche noire. E. Cocon avec le Ver qui s'y renferme. F. Mouche noire vue à vue d'oiseau. G. Mouche noire vue en profile." (A. Worm of the blue Moth. B. Cocoon of its chrysalis. C. Worm of the black Moth. E. Cocoon with the Worm enclosing itself inside. F. Black Moth seen from above. G. Black Moth seen in profile.). In *Letters on Piedmont Truffles*, 1780.

the publication. Therefore, this seemingly simple work about a type of mushroom, actually represented a much more expansive investigation of different life forms, using a range of scientific methods, tools, and technologies current in the period. All was made visible through the artistry of Borch and his artist-illustrator. Letters on Piedmont Truffles can thus truly be called a synergetic work bringing together art and science, which demonstrates how the young traveler learned to master a wide array of expertise during his Grand Tour.

It is worth noting that during his travels Borch made a special study of silk cultivation, even shipping at considerable cost mulberry bushes and silkworms home. Borch's interest in the potentially profitable science and industry of silk cultivation helps to explain his studies in lepidopterology, as he was likely investigating the lifecycle of silkworms. In private letters, he expressed the hope of establishing a domestic Polish silk industry with royal support, but the worms arrived in Varakḷāni putrid and dead, and he abandoned this undertaking as well (Noyes 2021, 29).

In Guttenbrunn's portrait, Borch wears the cross of the Order of Malta, highlighted against the brilliant green of his uniform of the Company of the Noble Cavalry of Lithuanian Royal Hussars, where he held the title of captain (and later major-general). He received the cross pendant of the Order of Malta during his visit to Malta. He wished to become a representative for the Order in Poland, underscoring his courtly self-fashioning and role as mediating intercultural agent at the Italian courts. The Maltese cross also made a visual reference to his two-volume publication Letters about Sicily and the island of Malta, an illustrated account of his travels through the peninsula's southernmost islands that was already completed, but still unpublished around the time that this portrait was painted (Borch 1782). Borch holds a folio inscribed in French "to His Holiness Pope Pius VI." This is a visual record of three different aspects of the young count's experiences in the ambit of the papal court in Rome: first, his prestigious audience with the pope; second, the dedication of his Sicilian Lythology to Pope Pius; third, his petition to the pontiff for prestigious catacomb

relics as well as relics of the true cross (Noyes et al. 2020, Noyes 2021). Decades after the count's death, the relics of the true cross that he eventually brought home to Varakļāni with an authenticating document, were determined fake and the authenticating document, a forgery, to the scandal of his sons (Noyes 2021, 46-47).

Thus far, this essay has described Borch as a career courtier, outlining some of his scientific and humanistic endeavors in pursuit of courtly prestige as visualized in his early portrait. However, nothing has been said so far about the success, or failure, of his pursuit of a courtly career. In fact, his aspirations to achieve high rank, favorable royal treatment, and titles, at home and abroad, were marked by a consistent lack of success throughout his lifetime. In Rome at the papal court, he was dismayed at being called a "nobody" and was forced by court etiquette to have his own audience with the pope superseded by the Polish royal secretary (Ibid., 31). In Naples, he found himself undone by court intrigue and scandal, denied the diplomatic title by the king, and finally his father threatened to cut off all funds unless he left Naples immediately (Ibid., 30). His experiences resonate with the self-representational mode captured in Guttenbrunn's portrait. Borch's private writings from this period suggest that the military rank indicated by the vibrant green Hussar uniform might not have been officially granted. He wrote that his own uniform was in tatters and he was without funds, so the dazzling emerald jacket may have been painted not after the genuine article, but from the artist's imagination (Ibid., 33). The elaborate intarsia table may or may not have been counterfeit stone, his pyrite could be mistaken for gold, and his sacred relic turned out to be a fake — these circumstances together underscore the elegant dissimulations essential to period courtly self-fashioning that brought about both the rise and fall of the young count in Italy.

Later in life, Borch's planned 36-volume magnum opus was never published, due to the Polish king's refusal to subsidize the project (Biliński 1977, 47-48; Polanowska 2013, 29-20). The monarch refused many of the Count's other requests for patronage, and after Borch failed to win from the king the position of Voivode of Livonia in 1791, and concurrent to the failure of the reform-minded Constitution of 3 May 1791, he withdrew from court politics and diplomatic activities in the 1790s to retire to his Varakļāni estate. After the Second and Third Partitions of Poland, he undertook a renovation of the manor in the style of a neoclassical villa ensconced within extensive gardens, to remake his estate into a cultural preserve and intellectual refuge (Spārītis 1998 & 2020, Polanowska 2012 & 2013, Noyes 2021). I raise all these points not to lessen the intellectual importance of Borch's scientific knowledge production, which, as the work of an aristocratic amateur in a courtly context, should not be minimized. In contrast, I would draw a parallel between his lack of success in his career as a courtier-diplomat, and the fact that the Partitions severely impacted his ambitions, his family's socio-political horizons, and especially finances.

Rather, I want to make a case for the crucial connection between Borch's scientific works and humanistic activities in the arts as exemplified in the Naples portrait, on the one hand, with his career as courtier on the other, and to reveal how the former resonated through, and intrinsically shaped, the latter. At first glance, to our modern academic sensibilities the scientific fields of mineralogy, volcanology, geobotany, mycology, microscopy, and lepidopterology, might appear unrelated. However, these fields all have a crucial aspect in common: their shared emphasis on studying correlations between external visible and internal invisible phenomena. In the courtly domains of Italy, Poland-Lithuania, and especially his home estate of Varakļāni during the period of the Partitions, when Polish Livonia shifted to Russian dominion, the outward performance of the inner self, and the ability to conceal or reveal oneself, played a crucial role.

Borch longed to be free from "the dictatorship of the Russians […] whom I detest, whose friendship I despise more than I fear their enmity" (Noyes 2021, 11). Yet he and his family needed to negotiate with czarist authorities, first to have their pillaged goods returned or reimbursed, and later to retain their territorial holdings. I thus want to make a case for the ways in which Borch's synergistic methods offered him a means to think through issues critical to his courtly aspirations, entangling his "scientific" and "humanistic" selves. In this sense we might say that for a man in Borch's position, volcanoes, pyrite, moths, and truffles were all "good to think with" (Clark 1997). Put differently, as an author, scientist, artist, and courtier, the count's ideas about these different fields of investigation related to the natural world complemented his other intellectual commitments — in particular, his conceptions of the cultural spheres of society and politics. By surveying Borch's wider intellectual and ideological purposes, no matter how seemingly dissimilar, we can thereby underline "just how far the nature of rationality is dependent on its historical context" (Ibid.).

The connection between his scientific, humanistic, and courtly pursuits should be reframed against his family's liminal position in the borderlands defining Europe's frontier, where complex negotiations and productions of identity were critical during the period of the Partitions of Poland-Lithuania, at a watershed moment in the discursive construction of conceptual geographies of "Eastern" and "Western" Europe (Wolff 1994). The count's particular geographic role as a man of wide learning positioned him as a defender of Polish specifically and "western" European culture more generally against Russian hegemony. Although the czarist Russia that Latgale (or, rather, Polish Livonia) faced during Borch's life is not the Russia of today, his scientific and humanistic activities as a means of defining and defending the sovereignty and autonomy of his homeland and of wider European values have present-day relevancy.

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BAMIYAN BUDDHA STATUES

Presentation by Professor Michael Jansen
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Thank you very much again. Dear colleagues, I am happy to see my colleague Anke Naujokat from Aachen. I have to say I am also Professor of Aachen University and so there are two of us from Aachen at this conference, which is quite a good sign.

Why do I say that? Because Aachen University has been trying to integrate the humanities and the natural sciences for thirty years. The nine faculties of the university have adopted an interdisciplinary approach to a number of issues, such as water and energy conservation. These and many other pressing issues can only be resolved thanks to the cooperation between the humanities and the natural sciences.

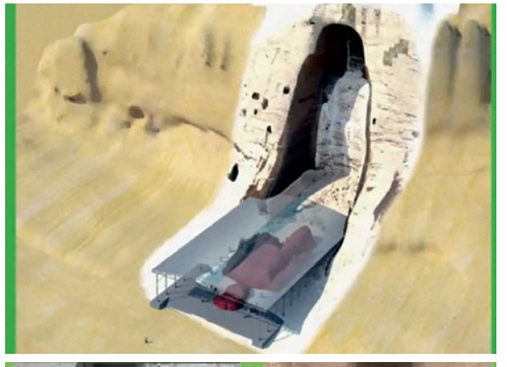
I was very impressed by the presentation of Professor Aron Faisa about the Bamiyan Buddha statues. The reconstruction of the statues, which were blown up by the Taliban in 2001, is a UNESCO project. In connection with this project, Professor Faisa has raised the questions of truth and authenticity. I will argue that the criterion of authenticity is not static or fixed but, rather, dynamic.

The fundamentalist Taliban movement, which destroyed the Buddha statues, can be seen as an outgrowth of the devastating war in Afghanistan which started in 1979 with the invasion of the Soviet Army and which ended for the Soviets in 1989. The destruction of the Buddha statues may be seen both as an affront to the West and as a provocation of the Hazara people, who live in the Bamiyan Valley and who are mostly Shia. The area where the statues were located was also one of the outposts of the Taliban from which they controlled the whole valley.

The so-called "Western Buddha", which was 55 meters tall, was the larger of the two Buddhas. The smaller "Eastern Buddha" was 38 meters tall. The Taliban reduced both statues to little more than piles of rocks at the bottom of their gigantic niches. It was in 2002, almost immediately after the ISAF had reconquered the territory controlled by the Taliban, that UNESCO and ICOMOS representatives came to visit Afghanistan. Professor Petzet, who was then the world president of ICOMOS, Professor Manhart, who represented UNESCO, the director of the Afghan Archeological department Abassi and I were the first to visit Bamiyan in order to inspect the destroyed statues.

In 2003, UNESCO declared the Buddha statues and the archeological site of Bamiyan a World Heritage site. An international group of researchers, including Professor Maeda from Japan and Professor Petzet from Germany, came together in Munich to plan the reconstruction of the Buddha statues and the stabilization of the niches, which is a good example of an interdisciplinary approach, involving experts in the humanities and the natural sciences. The decision by UNESCO to declare the cultural landscape and archeological remains of the Bamiyan Valley a World Heritage site was somewhat paradoxical since it came after the destruction of the Buddha figures.

"Cultural landscape" is quite a complex term as it refers to the natural environment that has been transformed by human activity. In my opinion, cultural landscape should not be seen as a static element, but, rather, as a dynamic, constantly evolving system at the intersection between nature and culture.



As we take a look at the Bamiyan Valley, we see a beautiful valley located at an elevation of two and a half thousand meters. In the fifth and sixth centuries, Buddhist monks introduced an irrigation system into the Bamiyan valley and turned it into a little paradise. The niches for the Bamiyan Buddhas were carved into the side of a cliff in the valley. Thanks to the synergy of the humanities and the natural sciences, the Buddha statues have been dated back to 560 and 590 AD, that is to a rather late period of the spread of Buddhism. The Buddha statues in Bamiyan are the westernmost monumental representations of Buddhist culture.

In 2003 and 2004, as no good maps of the area were available, we used satellite imagery to identify the precise locations of eight different World Heritage sites, and the problem is that these sites have their own individual buffer zones which cover approximately 200 square kilometers and which are not protected by UNESCO, but by the Afghan government.

One of the problems involved in reconstructing the gigantic Buddha statues was that at the bottom of the niches, the rubble left in the wake of the demolition was full of explosives, which made it very dangerous to proceed. We, the Bamiyan Working Group, decided to advance not from bottom up, but from top down. We had Italian mountaineers descend from the top of the niches on ropes and put in place scaffolding to stabilize the niches, which had been damaged in the explosion. The demining team brought out all the remaining explosives from under the rubble.

Some of the fragments of the statues weighed 40-50 tons and we needed heavy machinery to move them from the bottom of the niches. Once removed from the niches, all the individual fragments were numbered and placed in storage. The fragments of the Buddhas were not homogeneous rocks, but consisted of a variety of materials, which made them very fragile. At this point in our work, the conjunction of the humanities and the natural sciences once

again came to the rescue. We explored the niches with a scanner. In our exploration, we relied on the three-dimensional scan of the niches by Professor Gruen from Switzerland, which enabled us to get a realistic image of the niches, including the cracks in their walls. The scan also helped us to assess the damage and to decide how to stabilize the niches.

Stratigraphic identification also helped us to plan the reconstruction of the two Buddhas. A team of geologists documented the sedimentary strata of the back walls of the niches, which allowed us to identify the places where the individual fragments of the statues, which had been recovered at the bottom of the niches, had been located before the destruction of the statues. As a result, we were able to place some of them in their original positions within the niches.

And now I have to come to a very sad moment in my story. Twenty years of preparatory work to reconstruct the Buddha statues have been in vain due to the reoccupation of Afghanistan by the Taliban. We are in contact with Kabul. There is a UNESCO office there. We will have another conference on Bamiyan in Afghanistan in November, so there is hope that this very important work may resume.

The aixCAVE at Aachen University is a five-sided immersive virtual reality system, which allows us to visualize a three-dimensional cave-like environment. We have used this technology to produce a perfect virtual simulation of the Buddha figures, which should help us to reconstruct them using the technique of anastylosis. While the Hazara people of Bamiyan, would like to have the Buddhas rebuild to heal their wounds and to restore their pride, UNESCO might object to the reconstruction on the grounds of its inauthenticity.

Talking about the question of authenticity, I would like to mention Carcassonne, the medieval city in France which was rebuilt from scratch by Violett-le-Duc in the 19th century. Nowadays, this city is on the World Heritage list. The documentation of the Buddhas is with us and even in fifty or a hundred years we will be able to recreate them as a memorial for the world, as a reminder of the many monuments which have been destroyed and are no longer recoverable.

Thank you very much.

USE OF MILITARY AERIAL PHOTOGRAPHY IN HISTORICAL, ARCHITECTURAL AND ENVIRONMENTAL STUDIES: THE CASE OF DAUGAVPILS (DUNABURG, DVINSK) IN WWI

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ABSTRACT
World War I, despite its terrible destructive impact on many countries, was also a testing ground for several advanced technologies of that time, including military aviation and aerial photography. At that time, the role of military aircraft increased significantly. While at the beginning of the war in 1914, only a small number of airplanes, mostly for air reconnaissance, were used, by the end of 1918, reconnaissance aircraft, fighters, bombers, and airships all formed a new branch of the armed forces and changed the strategy and tactics of warfare. Aerial photography was quite a new technology at the beginning of World War I. However, it was employed by all countries involved in the conflict as an indispensable tool of wartime intelligence service. As a result, a significant number of photographs were taken from the air over the battlefields of World War I. Many of them have survived in archives throughout Europe, the United States, and other countries. These photographs represent not only the developing trench system, bunkers, airfields, artillery batteries, harbours, railway lines, and roads as components of military infrastructure, but also towns and cities with their architecture, as well as rural landscapes and other locations. The aim of the current paper is to present a vision of Daugavpils, its fortress, and surrounding area at the time of WWI based on the analysis of several aerial photos taken by German reconnaissance pilots in 1916–1918. Such photos are of great importance nowadays. They are especially helpful in the research of the historical development of the planning of Daugavpils. The photographs are analysed thanks to the relatives of one of the pilots who took them. The paper suggests that some of the photographs may be related to the visit of Prince Leopold of Bavaria (1846–1930), Commander-in-Chief on the Eastern Front in WWI, to Daugavpils on 5 May 1918.
Keywords: *WWI, Eastern Front, aerial photography, military aircraft reconnaissance, Daugavpils (Dunaburg Dvinsk) and Daugavpils Fortress, historical, architectural and environmental studies*

INTRODUCTION

Daugavpils (Dunaburg, Borisoglebsk, Dvinsk) is the second largest city in Latvia after Riga and is located in south-eastern Latvia on the banks of the River Daugava (Duna, Zapadnaja Dvina). The Historical Centre of Daugavpils is an architectural heritage site of national importance, and it attracts many local people and visitors of the city. It is also a great example of balance between innovation and tradition. The construction of the current city centre started at the beginning of the 19th century according to the project approved in 1826. Despite the long-standing history of the city, which was founded in 1275, we cannot find buildings older than the 19th century in the historical centre of the city because Daugavpils has changed its location three times. The history of Daugavpils began in 1275, when German crusaders built Dunaburg castle near the present-day village of Naujene 20 km up the Daugava from the current location of the city centre. During the Livonian War (1556 - 1583), Dunaburg Castle and the settlement around the castle were destroyed by the Russian troops. In 1577, Russians began to build a new castle 20 km down the River Daugava at the mouth of the River Šūņupe (Šuņica) near the present-day sewage treatment plant. Dunaburg (Daugavpils) developed in its second location as a town in the Polish - Lithuanian Commonwealth up to the second half of the 18th century. Currently, the centre of Daugavpils is in its third location, which started to develop when the construction of Dunaburg Fortress began in 1810 began. As a result, in the current city centre there is no architecture older than the 19th century. However, Daugavpils is one of the few Latvian cities and towns which have a unified ensemble of classical and eclectic architectural styles, including a variety of red brick buildings in the style of eclecticism. One of the central streets in Daugavpils is Rīgas iela, which extends from the River Daugava to the railway station and forms the core of the historical centre. Daugavpils also has an impressive protective dam, which was built along the right bank of the Daugava to protect the “new” city centre from the flood. The dam was built approximately at the same time (1829-1841) when the new city centre and fortress were built. The cultural heritage of Daugavpils encompasses historical, architectural, artistic, and industrial monuments.

During WWI, Daugavpils became the front line city in the autumn of 1915, and the headquarters of the 5th Russian Army was located there. After the unsuccessful bloody German attempt to capture Daugavpils and the fierce defence battles in September – October 1915, the front line became stabilised as the trench or positional war to the south and south-west of the city till the end of 1917 – the beginning of 1918. The city suffered significant damage when it was shelled by German long range artillery and bombed by German military planes and airships. The population decreased sharply, and many industrial sites and administrative institutions were relocated to the inner regions of Russia. From February to December 1918, Daugavpils was occupied by the German armed forces. As Daugavpils had suffered heavy damage during WWI and even heavier in WW2, historical photographs of the city are of great importance in architectural, historical, environmental, etc. studies of the past and of the present of Daugavpils. Many of them are in the collection of the Daugavpils Regional Studies and Art Museum, as well as in private collections in Latvia and abroad, and many can be found on the Internet. Therefore, aerial pictures made during WWI are highly interesting and useful for the reconstruction of what Daugavpils had looked like before WWI. One of such collections of aerial photographs of Daugavpils and the surroundings is that taken by one of the German reconnaissance observers during WWI. It is of great importance to make use of this unique collection of military aerial photographs in the research of the cultural history of Daugavpils, including the historical urban development of the city.

DEVELOPMENT OF MILITARY PHOTOGRAPHY AND TECHNOLOGY DURING WORLD WAR I AND ITS ROLE IN THE ACQUISITION OF COMBAT TACTICAL INTELLIGENCE DATA

The use of aerial photography increased rapidly during World War I (WWI), as reconnaissance aircraft were equipped with cameras to record enemy movements and defence lines. However, at the very beginning of WWI (28.07.1914), the usefulness of aerial photography was not fully appreciated, and most of the early reconnaissance from airplanes consisted of visual observations and written reports. Gradually, however, all the belligerents, including German, French, British, Russian, Austro-Hungarian, etc. armed forces, started using aircraft reconnaissance to accurately inform their commanders about enemy manoeuvres. By the end of August 1914, aerial reconnaissance was no longer an auxiliary means of gathering information, but rather the principal means by which armies received their operational reconnaissance. In contrast to the speed with which aerial reconnaissance provided needed data, cavalry reports might have taken a day or two to reach the staff headquarters. During the Battle of Tannenberg (08.1914), the German army masterfully used aerial reconnaissance to quickly advise its commanders of the Russian troop movements while the Russian commanders used the more traditional cavalry reconnaissance, which took more time. Thus, aerial reconnaissance was almost "real time" intelligence for commanders in the Great War and it also led to the improvement of photographic technologies. Intelligence officers covered headquarters walls with photographic mosaics of the battlefield, which they studied and compared with new photos delivered by aerial reconnaissance, noting every change. Accurate aerial reconnaissance warned armies of forthcoming offensives, informed commanders of the position of friendly troops, and was used to control artillery fire. Besides aerial reconnaissance, tethered or kite balloons performed similar missions. While most of the combatant countries possessed a few military aircraft in July - August 1914, these were almost exclusively provided for reconnaissance and artillery adjustment, supplementing other similar instruments like balloons and kites. Tethered balloons could reach the altitude of as high as a mile, but were easy to shoot down. They were also unstable observation platforms in any wind. Airships, like the huge German Zeppelin type dirigibles and others, were regarded as the best reconnaissance tools and they also served effectively as naval patrols.

Germany was one of the first countries to adopt the use of a photo camera for aerial reconnaissance. The first cameras it used were Goerz cameras. The French military aviation began the war with several squadrons of Bleriot observation planes, equipped with cameras for reconnaissance. The French Army developed procedures for getting photoprints into the hands of field commanders in record time. British pilots began to use cameras for aerial reconnaissance in 1914 and by the spring of 1915 the entire system of German trenches had been photographed. The United States played an important role in the last months of the war, using French aircraft and modified cameras. In Russia, aerial photography was started in 1886 by *poruchik* (i.e. lieutenant), afterwards lieutenant-general, Alexandr Kovanko (1856-1919), who was also a military engineer. He is called "the first Russian general of aviation" because he was prominent in the development of aerostation and aviation in Russia. He was also one of the founders of Russian aeronautics. In 1910, he was appointed commander of the Officers Aerial Navigation School, which trained the first pilots in Russia. World War I (1914-1918) served as a powerful push for the further development of military cartography. However, the most important event of this period was the widespread use of aerial photography – the basis of aerial photo-topographic reconnaissance of the enemy.

Using balloons for the purpose of reconnaissance of the enemy and using aerial

Aerial cameras of the German 257 aviation unit (Fliegerabteilung 257) http://www.flieger-album.de/geschichte/fliegerei/fliegerkammernmilitaerischephotographie.php

photography of the terrain for compiling topographic maps and plans were studied and taken into account by the Russian Army after the end of the Russian-Japanese war of 1904-1905, and aerial reconnaissance became used more widely with the dramatic increase in the number of aircraft in the Russian and other armies. Until the beginning of the First World War of 1914-1918, however, in Russia photography of the terrain from airplanes for reconnaissance purposes had seldom been used, although several attempts had been made to take aerial surveys in order to compile topographic plans and maps. Thus, until 1914, the Russian army had mostly used balloons and kites to carry out aerial reconnaissance. The increasing use of aeroplanes for reconnaissance purposes was accompanied by the development of aerial photography from airplanes.

The work carried out on the organization and official recognition of aerial photo-topographic reconnaissance to ensure the success of combat operations played a significance role in the preparation of military operations by the Russian Army. For example, in the summer of 1916, while preparing the famous Brusilov Breakthrough (June - August, 1916), the aerial reconnaissance units of the Russian Army photographed all the enemy positions from the air, and used the numerous photographic images thus obtained to create maps showing actual enemy positions. Russian reconnaissance aviation was equipped with good aerial cameras, primarily, with photo cameras designed by the Russian military developers V. F. Potte and S. A. Ulyanin. As of April 1, 1917, Russian aircraft squadrons had about 200 cameras of the Potte type, about 80 cameras of the Ulyanin type and about 120 cameras of other types, including aerial cameras of Thornton-Pickard. All aircraft of the air corps and of the army were equipped with aerial cameras. Thus, aerial photo-topographic reconnaissance in the Russian army, first used during the Russo-Japanese war of 1904-1905 mainly in the form of visual aerial reconnaissance, was further developed during WWI.

Chart of the reconnaissance flight of the crew, 02.03.1917.

THE DISCOVERY OF UNIQUE AERIAL PHOTOGRAPHS IN A PRIVATE COLLECTION IN GERMANY AND THEIR RELATION TO DAUGAVPILS AND ITS SURROUNDINGS

In what follows, I focus on the photographs of the reconnaissance aircraft crew of the German Field Aviation Unit No.4 (Feldflieger-Abteilung No.4, FF4), which depicted the Eastern Front between Russian and German troops, as well as the city of Daugavpils, its fortress and surroundings. While Professor Ojārs Spārītis of the Art Academy of Latvia was giving lectures at Phillips-University of Marburg, one of his listeners, Mr. Volker Fritsch, presented him with the aerial photographs preserved in the family archive by his relative, who had served as an aircraft reconnaissance observer during WWI. O. Spārītis ascertained that the photographs were directly related to the history of Daugavpils and suggested that I do the research discussed in this article. The photographs are good examples of the tasks that were typical for the aerial reconnaissance units of that period, and, because they were taken over Daugavpils and the vicinity, they complement our knowledge of the architecture and urban planning of Daugavpils and the fortress before their great devastation in WW2. The aircraft crew consisted of the pilot (Flugzeugführer), sub-sergeant-major (Unterfeldfebel), later sergeant-major (Feldfebel), Schulte and the observer-photographer (Beobachter-Fotograf), reserve lieutenant August Eggers (born 30.4.1888 in Hemelingen near Bremen – died 15.10.1960 in Bremen). According to the flight recorder diagrams (Flugschreiber-Diagramme), in the period from 24.6.1916 until 15.05.1918 the crew completed 24 reconnaissance flights and a number of combat missions.

Lieutenant A. Eggers - one of the two members of the German reconnaissance aircraft crew.

4. ANALYSIS OF THE CONTENTS OF THE AERIAL PHOTOGRAPHS FROM BY A. EGGERS' COLLECTION

According to their contents, the aerial photographs taken by Eggers' crew, which are at my disposal, may be subdivided into the following four sets:

1) battlefields, front lines, trenches, railways, etc.: strategic intelligence data;

2) the centre of Daugavpils, including the square near the Alexander Nevsky Cathedral;

3) Jaunbūve, or the New Settlement;

4) Daugavpils Fortress.

Next, I will comment on each of the 4 sets of photographs:

1) This set of photographs shows the situation in the Russian positions, including trenches, a cargo train, Russian air force airplanes, etc. Starting from the late 1915, the Eastern Front line was not far from Daugavpils and it remained relatively stable for approximately two years before the Unternehmen Faustschlag (Operation Fist Punch) – the German and Austro-Hungarian offensive on the Eastern Front in February-March 1918. The photographs taken over Daugavpils, and probably also over the fortress, display the situation when the German troops had occupied the town and region.

2) This set of aerial photographs depicts the centre of Daugavpils. As it has been mentioned before, the historical centre of Daugavpils is an example of urban planning of national importance. The uniqueness of this urban planning consists in the fact that in the 19th century the city centre had to be moved from the site where the fortress was being

constructed (1810 - 1878) and almost completely rebuilt on its current site in a relatively short time. During the 19th century, Daugavpils developed rapidly, especially after the building of the railways St. Petersburg – Warsaw and Libau – Riga – Ribinsk. Thanks to the new railway routes, Daugavpils became an important railway junction and industrial centre.

In 1839, the blueprint for the development of the city of Daugavpils was approved by the city authorities. At that time, it was an urban development project that had no analogues in Latvia: a monumental urban complex in which the main square adjoined the highway which led to an esplanade and eventually to the ramparts of the fortress with its Jesuit Cathedral. In the 1840s, according to the designs of the St. Petersburg architect A. E. Shtaubert, a two-story building of government offices and a gymnasium were built in the late Empire style in the main square of the city. In the middle of the square, the commercial life of the city and surroundings was in full swing. Wooden shops and storehouses of several markets crowded the square and gradually trade pavilions blocked the monumental perspective overlooking the fortress. In 1864, the Alexander Nevsky Cathedral was built in the centre of the square. It towered over the bustle of the market, as if personifying the victory of the spiritual over the material. The perspective of Saules Street was oriented towards the dome of the Cathedral. Later, in 1937, when Latvia was an independent country, a multifunctional complex of the House of Unity was built on the site of the market, enclosing the square and changing its monumental scale. The modest space behind the cathedral was turned into a square with a fountain in its centre. The historical centre of the city surprises its visitors with its stylistic architectural diversity. There are many red brick buildings built in the style of "Latgale Baroque". The historical centre of Daugavpils, especially the present-day Vienības (Unity) square and Rigas and Saules streets experienced drastic changes during WW2 (1941-1944 in Daugavpils), because more than 70% of Daugavpils was destroyed in the war. Therefore, the aerial photographs of the German military aviators taken over the centre of Daugavpils in WWI are of great importance.

The aerial photographs in this set probably show an interesting event in military history and in the history of Daugavpils, and the date on the photograph below supports

this hypothesis. On 14 May 1918, Prince Leopold of Bavaria (1846 - 1930), Field Marshal of Bavaria and Prussia, Commander-in-Chief of the Eastern Front of Germany, arrived in Daugavpils. His Highness arrived at the railway station, which was decorated with flowers and Bavarian flags. In the evening, the prince walked along the city streets. The next day, early in the morning, a military parade was held in the current Vienības laukumus (Unity Square) with the participation of aircraft that flew over the square. This visit took place after the recent signing of the Treaty of Brest-Litovsk, according to which Latgale was separated from Russia and transferred to Germany, like other parts of present-day Latvia. The Prince Leopold of Bavaria took a direct part in the process of preparing the Treaty of Brest-Litovsk. The Prince also visited Daugavpils fortress. The aerial pictures showing the parade and the inspection of the troops by Prince Leopold are of great historical value. As it has already been mentioned, the centre of the city around the main square has changed dramatically, mostly during WW2; therefore, each picture showing it before the destruction in WWII is a jewel for historical and architectural research.

3) The aerial photographs in this set show Jaunbūve (the New Settlement / Новостроение), one of the historical districts of the city, which is now the largest district of Daugavpils. It arose in the middle of the 19th century on the outskirts to the North-East of the centre as a workers' residential area. When the construction of private wooden houses began on the third *verst* (the old Russian measure of length – one *verst* is equal to 1.067 km) of the St Petersburg – Kovno (present Kaunas) highway from the crest of the hills near the city centre and in the direction of St Petersburg. A network of streets gradually developed; factories, such as a locomotive repair plant and a lead shot factory, and various public projects, such as a fire station, were built. Churches of different denominations were also built on the hill (nowadays it is known as the famous Church Hill), including the Orthodox Cathedral of Sts. Boris and Gleb (1905) which replaced the garrison church, a Lutheran church (1893), the Catholic Church of the Virgin Mary (1905), the Old Believers' prayer house of St. Nikola (1908 – 1928), and the *Edinovercy* (Orthodox old believers) Church. The first three of these churches can be seen in the first photograph below. Mostly wooden buildings were built in the area surrounding the churches, but along Shosseynaya Street (Highroad, present-day 18.

Novembra iela), and in other parts of the district, stone buildings also were built. The area shown in the photograph suffered heavy damage during WW2 when the fires of 1941 and 1944 destroyed many buildings, both stone and wooden ones even though, not surprisingly, the wooden buildings were more heavily damaged or altogether destroyed. The second photograph below shows a more panoramic view of Jaunbūve in the north-eastern direction, including the roads leading to Rēzekne and, eventually, to St Petersburg. The images of the churches and of the surrounding areas in the aerial photographs of Eggers' crew are a good reference point for historical research.

4) The aerial photographs made over Daugavpils Fortress (Dinaburg / Dvinsk Fortress) included in this set are also very interesting. Daugavpils Fortress is the only early 19th century military

fortification of its kind in Northern Europe that has been preserved without significant alterations. The construction of the fortress began in 1810, before the invasion of the Russian Empire in 1812 by the French troops led by Emperor Napoleon. Due to the French invasion and other events, such as, for example, flooding, the construction of the fortress, was completed only in 1878. For a long time, the fortress was an important outpost on the western frontier of the Russian Empire, protecting the highroad to St. Petersburg. The direct route taken by Russian royalty and nobles from St. Petersburg, in that time capital of the Russian Empire, to Western Europe led afterwards right through Daugavpils. The fortress is located on both banks of the river: on the left bank – the front bridge fortification, on the right – the main part of the fortress (citadel); the two parts of the fortress were connected by a wooden pontoon bridge. The monumental earth rampart system was reinforced with hewn stone and a deep moat. The fortress has eight bastions, ravelins, courtine lunettes and other additional fortification elements. The most important architectural structures in the fortress are two – and three – story buildings of the commandant's house, living-houses of officers, artillery and engineering arsenals, soldiers' barracks (Alexander, Konstantin, and Nikolai barracks), a huge hospital, residential buildings for command personnel, and four fortress gates. The fortress is shaped as an oval, which is divided into regular quarters. In the middle of the quarters, there is a parade square. The building which towered over the fortress was a 60 m high two-steeple baroque church, originally Jesuit Catholic, later Orthodox, and then ecumenical, built in 1736-1746. The church was destroyed in 1944. The fortress was only slightly damaged in WWI, even though it was the headquarters of the Russian 5th Army. Many buildings of the fortress are architectural monuments of national or local significance. The photographs taken by German observers show the Fortress Church lost during WW2. However, the fortress has experienced some other changes apart from the destruction of its church since the time when the aerial photos were taken, which is seen in the second picture above: zigzag access roads to the Northern (Alexander) gate, which were later straightened; the 4th ravelin, which was destroyed in the Soviet period; and the 4th counterguard, which was partially destroyed and replaced by a complex of garages and other buildings.

CONCLUSION

It is more than desirable to use the unique military aerial photography in the research of cultural and urban history, including the research of the historical development of Daugavpils city planning. Thus, we acknowledge the importance of the development of photo technologies, including aerial photography, which started in 1858 and made its debut in military aerial reconnaissance in 1914-1918. The photographs of Daugavpils taken in WWI help us to reconstruct the development of the city in the 19th and 20th centuries.

Acknowledgments

I would like to thank Professor Ojārs Spārītis of the Art Academy of Latvia for delivering the aerial photographs discussed in my article from Germany to Latvia. While Professor Spārītis was giving lectures at Phillips-University of Marburg, one of his listeners, Mr. Volker Fritsch, presented him with the aerial photographs preserved in the family archive by his relative, who had served as an aircraft reconnaissance observer during WWI. O. Spārītis ascertained that the photographs were directly related to the history of Daugavpils and suggested that I do the research discussed in this article.

Also, I would like to express my gratitude to Valentīna Slavkovska, deputy head of the research department in the Daugavpils Museum of Regional History and Art, who helped me with my research of the development of both the historical centre and the outskirts of Daugavpils during WWI.

Finally, I would like to thank Oļegs Vinogradovs, collector of historical artefacts and founder of the private museum "Pie Komandanta", which preserves and exhibits the objects related to Daugavpils and its Fortress during WWI, for the information he gave me about Daugavpils Fortress and the military units fighting on the Eastern Front during WWI.

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STATISTICAL APPROACH TO A UNIQUE PROJECT IN THE HISTORY OF SACRAL ARCHITECTURE IN LATVIA

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ABSTRACT
After March 3, 1562, when Gotthard Kettler relinquished his position as Master of the Teutonic Order in Livonia, he accepted the new title of the Duke of Courland and Semigallia. To obtain a true picture about religious life in the Duchy in 1566, he instructed the Court clergyman Stephan Bülau to organise and provide the first survey of religious affairs in the country and to produce true statistics on the material and clerical condition of parishes, churches and religious life.
On the basis of the analysis of the received information, already a year later – on February 28, 1567 – Gotthard Kettler, Duke of Courland and Semigallia, issued a decree on the foundation of 70 new parishes in the Duchy and the construction of new churches, as well as three schools and three asylums. After the Reformation, initiated by Martin Luther in Germany in 1517, and the ensuing process of transition from Catholicism to Protestantism in Livonia from 1523 to 1525, the process of consolidation of Protestantism in the Duchy of Courland and Semigallia took place in the second quarter of the 16th century. The decree obliged the nobility and landowners to follow the statutory provisions and start establishing parishes and building Lutheran churches on their estates.
Already in 1570, the initiated campaign resulted in the foundation of parishes and the provision of services in rooms adapted for sacral function. But it was only after 1590 that the process of building new churches gained momentum and continued unabated up to the abolition of the Duchy of Courland and Semigallia in 1795 with its incorporation into the Russian Empire.
The role of statistics in this survey may draw a picture of the dynamics of church building in three successive artistic styles: Renaissance, Baroque and Neo-Classicism. The churches built in the 17th and 18th centuries are of considerable value in the Latvian architectural heritage.
Keywords: *Statistics, Protestantism, Architecture, Church, Duchy of Courland and Semigallia*.

During the 16th century the erosion of the system of Livonian monastic states – bishoprics and other territories in possession of the local branch of the Teutonic Order and occupying most of present-day Latvia and Estonia – led, in 1561, to the creation of a new political entity – the Duchy of Courland and Semigallia as a dependant tributary state of the Polish-Lithuanian Commonwealth. Following the pattern of the secularised Teutonic Order in Eastern Prussia, which under the leadership of Duke Albrecht already in 1525 had turned into the first Protestant state – the Duchy of Prussia – with the centre in Königsberg, the last Master of the Teutonic Order in Livonia, Gotthard Kettler, exercised religious autonomy and introduced the Lutheran church to the Duchy of Courland and Semigallia.

The new wave of Reformation was nothing new for the region because several representatives of the nobility had already introduced Lutheranism on their estates, built new, or repaired former Catholic, churches and chapels and invited Lutheran pastors to provide services. But this transition from Catholic confession to Lutheranism had a very sporadic character and did not guarantee success for the Reformation in all of the territory. The Teutonic Order had only superficially carried out its mission to Christianise the rural population and had erected few churches within the territory of the feudal states. There was little longing for Roman Catholicism in the Baltic lands. Baltic Old Prussians and Prussian Lithuanian peasants continued to practise pagan customs in some areas, for example, adhering to the beliefs in Perkūnas, Potrimpo and Pikullos. Bishop George of Polentz had forbidden the widespread forms of pagan worship in 1524 and repeated this ban in 1540.[1] Stephan Bülau, the Court clergyman of the Duke of Courland, was asked in 1566 to provide a general inventory (called visitation) of the churches in the Duchy. Disappointed by the results, he gave up his position as a court clergyman and the first superintendent in Courland and went to Germany.[2] During his visitation, he counted only 35 churches and 25 chapels, which was not nearly enough to realize the goals of establishing and strengthening the process of Reformation.

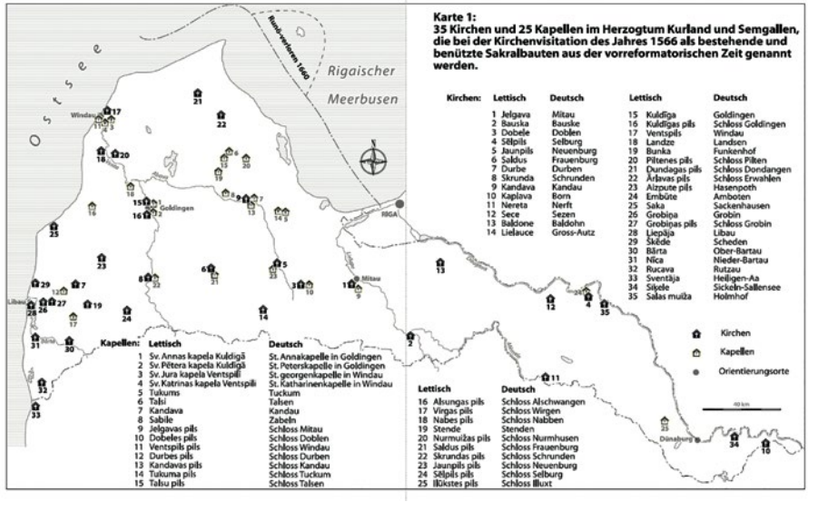

Fig. 1. Map of churches and chapels identified during the visitation of 1566. From: Die baltischen Lande im Zeitalter der Reformation und Konfessionalisierung. Teil 2, Aschendorff Verlag, Muenster, 2010, S. 168-169.

The next step in the Lutheranization of the Duchy taken by the Duke of Courland and Semigallia, Gotthard Kettler, was to prescribe the foundation of new parishes and construction of 70 new churches, as well as several schools and hospitals in the territory of

1 Albertas Juška, Mažosios Lietuvos Bažnyčia XVI-XX amžiuje, Klaipėda: 1997, pp. 742–771, hereinafter the German translation Die Kirche in Klein Litauen (section: 2. Reformatorische Anfänge; (in German)) on: Lietuvos Evangelikų Liuteronų Bažnyčia, retrieved on 28 August 2011.
2 Kallmeyer, Th. Die evangelischen Kirchen und Prediger Kurlands. Mitau, J.F. Staffenhagen und Sohn, 1890, S. 3, 211-212

the Duchy.[3] All over Europe such a "masterplan" – to found numerous parishes and to build new churches – marked the second wave of Christianisation. And it meant that during the first centuries of the German mission Christianisation had been carried out very superficially. To whom did the Duke of Courland address this prescript? Only to the landlords who came by land as property or lease thanks to the collapse of the Teutonic Order, and who after their military service were motivated to consolidate their landed estates by turning them into manors, and the church played an essential role in this process. This situation made Duke Gothard Kettler's project unique in Europe. After the Reformation, Protestant countries, like Germany, Prussia, the Netherlands, Switzerland and Scandinavian countries, did not immediately need new churches and adapted former Catholic churches for the new services. After the Peace of Augsburg – at the turn of the 17th century – there appeared a need in European Protestant countries for new parish churches in both towns and the countryside. The Duchy of Courland and Semigallia was the first among them to identify an acute need for new sacral buildings and to address this need by initiating the building of new churches on a massive scale.

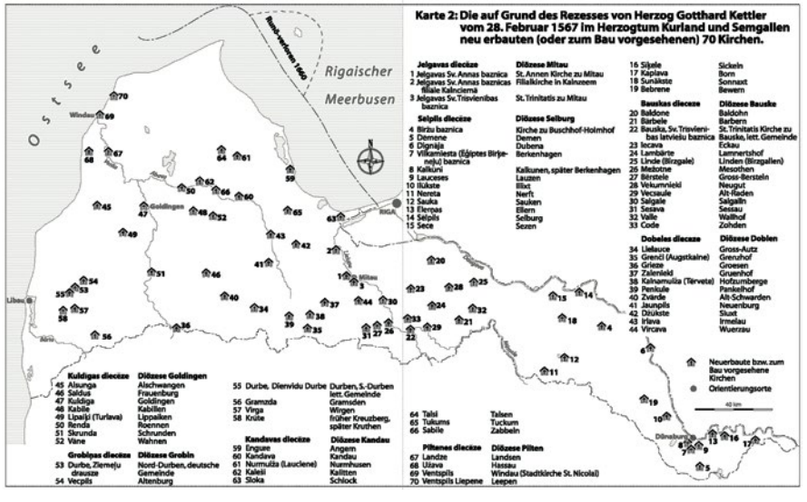

Fig. 2. Map of 70 churches mentioned in the ducal prescript from 1567. From: Die baltischen Lande im Zeitalter der Reformation und Konfessionalisierung. Teil 2, Aschendorff Verlag, Muenster, 2010, S. 172-173.

An exceptional initiative was launched by the Huguenots in France with their "Temple de Paradis" in Lyons, establishing a new type of sacral space for reformed services and public gatherings.[4] This tradition was interrupted by the Massacre of St. Bartholomew on August 23-24, 1572. The German nobility and royal families in Denmark, supporting Protestantism,

3 Kallmeyer, Th. Die evangelischen Kirchen und Prediger Kurlands. Mitau, J.F. Steffenhagen und Sohn, 1890, S. 7-11

4 Mai, H. Tradition und Innovation im protestantischen Kirchenbau bis zum Ende des Barock. – In: Geschichte des protestantischen Kirchenbaues. Verlag Junge und Sohn Erlangen, 1994, Abb. 4, S. 15

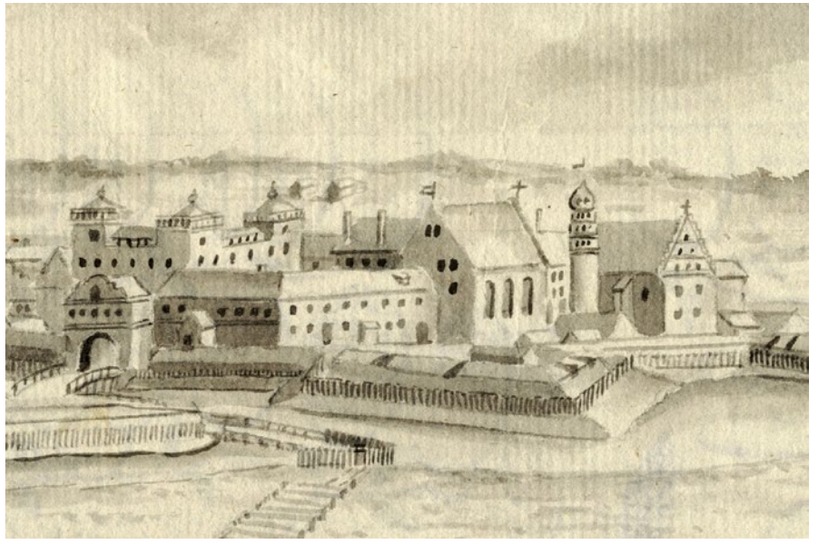

Fig. 3. Mitau (Jelgava) castle with a chapel. Fragment of a watercolour by Brotze J.Chr.- In: Brotze, Johann Christoph. Sammlung verschiedener Lieflaendischer Monumente, Prospecte, Muentzen, Wapen etc. Bd.IX, Bl.16. Inv.nr.R4970. LUAB.

Fig. 4. Restored chapel of Doblen (Dobele) castle. Photo by O. Sparitis, 2020

established richly decorated chapels in their residences for private use only. Count Friedrich von Sachsen was one of the first supporters of the Reformation in German countries, and in his castle of Torgau a Protestant chapel was consecrated already in 1544.[5] In the Castle of Gottorf in Schleswig-Holstein a new interior for a Lutheran chapel was created in 1590-1593 and Hans Vredeman de Vriese's patterns of graphic design inspired the work of the wood-carver Heinrich Kreienberg, who decorated the chapel.[6] After his marriage to Anna, daughter of Duke Albert of Mecklenburg, even Duke Gotthard Kettler followed these early examples. Already in the 1580s and 1590s he modernised his ducal residence in Mitau (Jelgava) and added to it a new wing with a chapel in it.

Another ducal residence in Doblen (Dobele) was an important venue for noble gatherings, and during the last quarter of the 16th century one wing of the former castle of the Teutonic Order was rebuilt and adapted to serve as a Protestant chapel. After lying in ruins for 300 years, the chapel walls now are conserved and the regained space is being used for cultural venues, although without any link to its previous sacral function.

How did the situation with the planned 70 Lutheran churches develop in the Duchy of Courland after the announced prescript? To stimulate the process of the so-called "*Kirchenreformation*" it was necessary to work out a "manual" or prescript for Lutheran parishes and priests. Courlandian superintendent Alexander von Einhorn borrowed the pattern of the Riga "*Kirchenordnung*" and on September 18, 1570, Duke Gotthard Kettler signed it. Two years later the manual was printed in Rostock.[7] The prescript was crucially important for the actual construction and functioning of the sacral buildings. To set an encouraging example, in 1573 the Duke's family and representatives of the nobility initiated in Mitau (the capital of the Duchy, today Jelgava) the construction of the Holy Trinity church for the German parish and the church of St. Anne for the Latvian parish. However, the erection of each church took more time than planned, and it was only in 1615 that the German parish church of the Holy Trinity was consecrated, while the Latvian parish church of St. Anne, only in 1641. Around the same time or a little later most of the wealthy noblemen followed the Duke's prescript and started to erect sacral buildings on their estates.

The subsequent part of the current paper is based on the statistical analysis of the construction process of the 70 churches promoted by the Duke and church administration as an ideological tool for religious policy in the country and proceeding up to the abolition of the Duchy of Courland in 1795. We may conclude from the records that none of the landlords started to erect a church on their estates immediately after the signing of the ducal prescript. However, regular church visitations by the church administration have left documents on building initiatives, technical condition of churches, material used for church building and changes in confessional practices, if they took place. Visitation documents as well as monuments of sacral architecture that are preserved today allow us to illustrate the dynamics in the building process and the evolution of the most typical patterns of Courland Lutheran church architecture.

During the first decades after receiving their landed property, the Courland nobility were busy with the organization of their economy, specialising in the most profitable branches of agriculture. When developing landed estates, the landlord's first obligation was to put up

5 Goßmann, D. Emporenkirchen und Kirchenemporen in Deutschland im 16. Jahhundert. - In: Geschichte des protestantischen Kirchenbaues. Verlag Junge und Sohn Erlangen, 1994, S. 29

6 Wendt, A. Schloß Gottorf. Schnell und Steiner, Regensburg, 2000, S. 41-45

7 Förstermann C.E.Neues Urkundenbuch zur Geschichte der evangelischen Kirchen-Reformation. Georg Olms Verlag, Hildesheim-New Zork, 1976. Reprint after first edition Hamburg 1842, p. 46

stables, barns, kiln houses, sheds, cellars and other buildings necessary for processing meat and grain. In such a situation, building a new church did not seem to be an urgent necessity, and the erection of a sacral building, even after the prescript of the Duke, was usually postponed. The prescript of 1567 obliged the landlord to cover almost all costs of the supply of materials and to organise builders and craftsmen involved in the church construction, yet not all noblemen were ready to invest a lot of money in building and furnishing churches with expensive fixtures. Therefore, in case the initiative for church building was launched, timber, the cheapest material to be obtained on a landlord's property, was often used.

Because in the Baltic climate wood is not a particularly durable material, on some estates wooden churches have been erected several times in the same place. For example, on the estate of Ober-Bartau (today Bārta), over the period from the 1560s to 1901, the former dilapidated wooden church building was replaced five times.[8] The very short life of wooden churches is accounted for not only by the poor resistance of wood to the Baltic climate, but also by fires, the destructions of war and careless maintenance. We may always find exceptions, but an average lifetime of a wooden church in Latvia's regions of Courland and Livonia during the 16th – 18th centuries was from 30 to 80 years.[9] Typical examples of the archaic type of wooden buildings in the given region are the churches in Kruthen (Krūte), built in 1642-1646; in Usmaiten (Usma), built in 1703-1704; and in Lieven-Bersen (Līvbērze), built in 1647-1665 or 1684 at the latest.[10]

Fig. 5. Church of Kruhten (Krūte), 1642-1646
Photo by O. Sparitis, 2005

The diagram demonstrates the dynamics of church erection on estates, mentioned in the Duke's prescript, and suggests that from the end of the 16th century building of wooden churches predominated, and a new wave of construction of wooden sacral buildings is observed again in the third quarter of the 18th century. Geographically, wooden church buildings had mainly been erected in the so-called Oberland (Sēlija) – the southern part of Courland bordering on the Kingdom of Poland and Lithuania.

However, construction of one wooden church after another was not a conscious goal of the landlords, and even when they had the finances to build a more expensive and luxurious church, a dilapidated church was replaced with another one that was not in any significant way an improvement on its predecessor.

8 Kallmeyer, Th. Die evangelischen Kirchen und Prediger Kurlands. Mitau, J.F. Steffenhagen und Sohn, 1890, S. 107.

9 Kampe, P. Baznīcu celtniecība Vidzemē zviedru valdības pēdējos piecdesmit gados (1660.-1710.).-Latvijas Ūniversitātes raksti, Arhitektūras fakultātes sērija II, 1, Rīga, Latvijas Ūniversitāte, 1937, 29.-44. lpp.

10 Svilāns, J. Latvijas Romas katoļu baznīcas un kapelas. 1975. 1. daļa. Rīgas Metropolijas kūrijas izdevums, Rīgā, 1995, 293. lpp.; Putniņa M. Sakrālās arhitektūras un mākslas mantojums Zemgalē. Rīga, Neputns, 2015, 107. lpp.

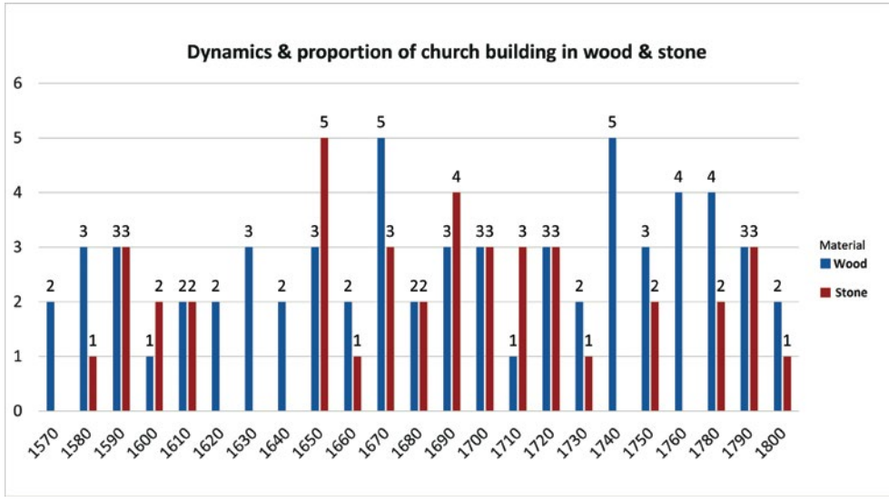

Fig. 6. Diagram of chronological dynamics of church erection and proportion of wooden to stone buildings

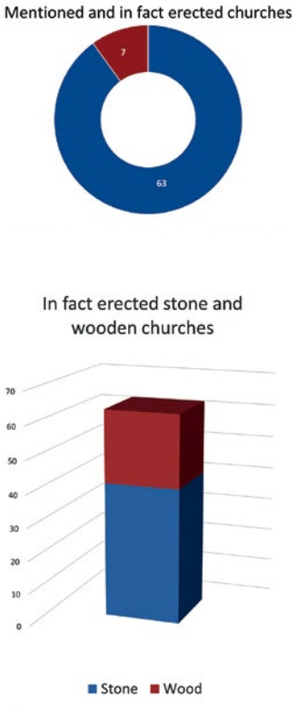

Fig. 7. Diagram showing the erected and not erected churches

The data presented by Theodor Kallmeyer (d. 1859), priest of the Landsen church and Lutheran church historian, allow us to make another important statistical observation. During his studies in the consistorial archives and his work with parish collections of documents, he established that of the 70 churches mentioned in the ducal prescript seven were not built due to the change of the owner of the estate or changes in the estate borders and the configuration of the estate.

Based on economic and logistic considerations, the evolution of the property size and configuration caused the replacement of the formerly planned location of the estate centre and changed the network of roads to the markets, regional centres and religious buildings as well. Due to the changes in the confessional affiliation of the landowner, five parishes were converted back to Catholic ones, and the existing church buildings had been reopened as Catholic churches with all expected consequences: a new priest, an altered interior, a new liturgy and new hymns. The re-Catholicization of Protestant parishes was not a typical phenomenon, but it happened in the Duchy of Courland and Semigallia, which, as a tributary state, was subordinated to the government of the Polish-Lithuanian Commonwealth.

This happened in Alschwangen (Alsunga) when the owner of the estate, Johann Ulrich von Schwerin, after his military service in Poland and marriage to Catholic Barbara Konarska, in 1634 changed his confession and all

farmers on his land were re-Catholicised.[11] Sometimes the rivalry between Lutherans and Catholics led to serious clashes (for example, in Subbath, or Subate) which split the local community and put an end to the peaceful coexistence of two congregations in the same church The only way out of the situation was the foundation and building of a new Lutheran church in 1685.[12]

Fig. 8. Re-Catholised former Protestant church in Alschwangen (Alsunga). Photo by O. Sparitis, 2010.
Fig. 9. Protestant church in Subbath (Subate). Photo by O. Sparitis, 2017.

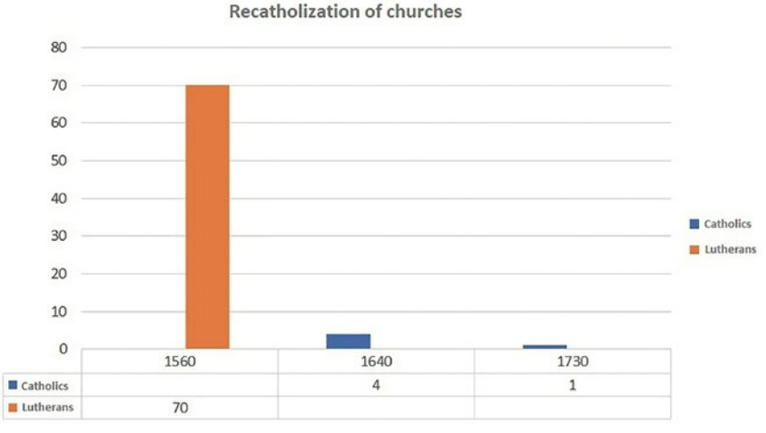

Fig. 10. Diagram of Protestant and re-Catholicised parish churches

The case of Altenburg (Vecpils) and Ilmajen (Ilmāja) was similar, when in 1726 the landlord Otto Friedrich von Rappe changed the confession of his Lutheran parish to Catholicism. After many years of internecine discord, one church – Ilmajen – in 1782 was returned to the Lutheran parish, but the other – Altenburg – remained Catholic.[13]

11 Kallmeyer, Th. Die evangelischen Kirchen und Prediger Kurlands. Mitau, J.F. Steffenhagen und Sohn, 1890, S. 93
12 Kallmeyer, Th. Die evangelischen Kirchen und Prediger Kurlands. Mitau, J.F. Steffenhagen und Sohn, 1890, S. 63
13 Kallmeyer, Th. Die evangelischen Kirchen und Prediger Kurlands. Mitau, J.F. Steffenhagen und Sohn, 1890, S. 109-110

The diagram shows two main waves of the re-Catholicisation of four parishes mentioned in the list of 70 churches: around 1636 -1640s and in 1720s -1730s, totally losing four churches, but in general in all of the Duchy of Courland changes of confession affected even more parishes.

Reacting to the Duke's prescript, several landlords tried to start building churches as soon as possible, but it happened in any case at the end of the 16th or the beginning of the 17th century, and even then the churches were erected with very minimal means: simple, robust, often without a tower, like at Ilmajen or Strasden (Strazde). The church of Ilmajen remained without a tower until modern times, and the church in Strasden, where the von Buttlar family was responsible for the fulfilment of the prescript, got its tower only in 1872. Following the medieval tradition of erecting chapels for pilgrims, travellers and tradesmen, churches of such simple construction were located on the busiest roads that connected towns and markets.

Fig. 11. Church of Ilmajen (Ilmāja). Photo by O. Sparitis, 2007. Fig. 12. Church of Strasden (Strazde). Photo by O. Sparitis, 2007.

A different principle was applied when the church was built in the centre of an estate, close to the landlord's residence or the centre of a village. It was prompted by the nobleman's wish to establish a church in his domain for prestigious services and funerals as well as his intention to build a crypt or vault for his family burials. An engraving from 1866 depicts the ensemble of Neuenburg (Jaunpils) castle and a church (1590-1592) therein, which perfectly epitomizes the fusion of administrative, economic and religious power.14 We may see a similar symbolism in many other places, including the church in Nerft (Nereta), built in 1593 by the von Effern family. The church lies on a hill and has a high foundation with a spacious crypt. Because of the social differences between the aristocracy and farmers, the crypt in the church was built exceptionally under the altar and thus underlined the high significance of the burial place in the eyes of landlords as well as of the parish.

As the building boom of Courland Lutheran churches in the middle and second half of the 17th century reached its peak, the Protestant church architecture and interior achieved their most distinguishing characteristics. The main types of sacral architecture derived

14 Stavenhagen, W.S. Album Kurländischer Ansichten. Mitau, Im Selbstverlag des Herausgebers, 1866, S. 191

Fig. 13. View of the castle and church of Neuenburg (Jaunpils)

Fig. 14. Church of Nerft (Nereta). Photo by O. Sparitis, 2017.

from late medieval German village churches, or “Dorfkirchen”, are not particularly varied, but each of them, depending on the landlord’s finances and artistic ambition, reveals an individual character thanks to its peculiar architectonic, artistic and aesthetic features. From the promulgation of the Duke’s prescript in 1567 until the abolition of the Duchy of Courland and Semigallia in 1795, the church (or sacral) architecture in the Duchy of Courland and Semigallia evolved from a large hall-type church with the nave and chancel united in one big spatial complex, as in Durben (Durbe) in the 1650s, to a tripartite church in Hofzumberge (Tērvete, 1609-1612), consisting of a tower, nave and chancel, and the church in Nurmhusen (Nurmuiža, 1594) with a nave flanked by aisles, which is unique for Courland.

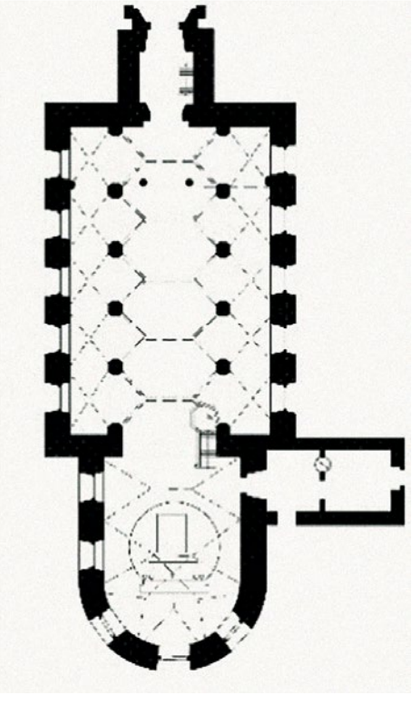

Fig. 15. Church of Nurmhusen (Nurmuiža). Photo by O. Sparitis, 2018.. Fig. 14. Plan of Nurmhusen (Nurmuiža) church[15]

Conclusion

The history of the Duchy of Courland (1561-1795) is a unique phenomenon in the general history of monarchic Europe after the schism between Catholicism and Protestantism and the bloody clashes that followed in its aftermath. The divisions brought about by the Reformation are even today present in Latvia and suggest multiple directions for further research.

15 After the draft by J. Šterns, 1957.- In: VKPAI Piemineklu dokumentācijas centrs, Dokumentu fonds. Nurmuižas baznīcas lieta, Inv. Nr. 45590-2.

The historic decision of Gotthard Kettler, Duke of Courland and Semigallia, to found 70 new Protestant parishes and to build the same number of churches in the country has no precedent either in the cradle of the Reformation – Germany, the Netherlands, Switzerland, and Scandinavia – or in any other European countries affected by explosive changes in confessional orientation.

The prescript of Duke Gotthard Kettler from February 28, 1567, relies on the subordinative relationship between the Duke and the nobility, obliging them to establish Protestant parishes and finance the erection of church buildings as fast as possible. After the dissolution of the Teutonic Order, most landlords in the Duchy of Courland and Semigallia came into possession of the former lands of the Order, and now they were called on to support the fragile achievements of Protestantism in the country.

Having studied the chronology of building 70 Protestant churches in the Duchy of Courland and Semigallia, the author of the current article has shared some results of his statistical approach to the study of the number, dynamics and proportions of the planned and actually constructed sacral buildings, revealing, thus, important paradigms in the process of their construction. The tables included in the article help to illustrate the dynamics of church building after the announcement of the ducal prescript of 1567 and allow us to imagine the achievements and losses of this “second wave” of Christianisation in the Baltic countries, especially in Courland. The building project initiated by Duke Gotthard Kettler had a crucial and mobilising role in the creation of the confessional identity of contemporary Latvia. What is more, on the basis of the Duke’s massive master plan for building churches our Protestant identity has grown and stimulated us to develop our Latvian literature, education, science, world outlook and fundamentals of contemporary social life.

DIGITAL RECONSTRUCTION OF SACRED INTERIORS WITH 3D MODELING AND VISUALIZATIONS WITH AUGMENTED REALITY TECHNOLOGY

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ABSTRACT
The fate of the Latvian Lutheran churches has been deplorable: many sacred interiors were destroyed in World War I and World War II and in the subsequent post-war years due to the then dominant atheistic ideology. Thanks to the enthusiasm of historians and many other people, some of the sacral art pieces decorating the church interiors have been saved. This article presents a detailed study of 3D modelling as a form of digitisation and of its importance for the preservation of Latvian cultural heritage. The current research focuses on the extant fragments of the lost sacred interior of the Biķernieki Church, which are preserved in the Rundāle Palace Museum. The example of the Biķernieki Church opens new prospects for further research. In addition, the article gives examples of techniques for creating 3D models and of ways of displaying them both on the Internet and through augmented reality.
Keywords: *3D models, digitisation, augmented reality, sacred interior, Biķernieki Church, Jakob Ernst Meyer, cultural heritage protection*

Digitalisation is increasingly important today. Museums around the world are digitising their collections and making them publicly accessible. Digitisation makes a particularly important contribution to research in art history, allowing quick and easy access to the collections you need. The second major benefit of digitalization of archival sources is the preservation of cultural heritage for future generations.

Today in Latvia, several works of sacral art, such as altarpieces and wood-carved sculptures, can be seen in sacred interiors. Unfortunately, as a result of tragic historical events, a large number of the church interiors have been irretrievably lost, and many have been preserved only partially and are located in not always easily accessible places.

The history of the Latvian Lutheran churches, compiled by the cultural heritage protection specialist and photographer Vitolds Mašnovskis, provides an insight into the architectural and artistic value of the churches. His research shows that the greatest damage to historic sacred interiors was caused by the First and Second World Wars. During the First World War, 20% of the Latvian Lutheran churches were damaged. During the inter-war period, several churches were restored, but during the Second World War about 30% of the churches were destroyed again (Mašnovskis 2005, 2006, 2007). During the war, church towers were bombed and church pipe organs were damaged. After the end of World War II, the churches started to be rebuilt again, but the Soviet regime tried to slow down the process and the 1960s and 1970s proved fatal for many churches.

After Latvia was annexed by the Union of Soviet Socialist Republics (hereinafter USSR), the attitude to religion changed for the worse. In her publication about the Latvian Evangelical Lutheran churches in the period 1944-1990, the historian Ilma Zālīte describes the events of that time: “The Soviet authorities devoted a lot of energy and attention to combatting and destroying the Christian church, starting with the nationalisation of pastors’ houses, the land belonging to congregations, and all other church property, and ending with intimidation and repression of congregants” (Zālīte 2000, 359). Some ordinary intolerant members of Latvian society also took part in destroying and vandalising churches with impunity. In the 1950s, the situation became even worse, and quite apart from atheistic propaganda, the USSR Council of Ministers was granted the right to contribute to the material deterioration of the churches (Zālīte 2000, 361). As a result of these actions, about 33% of congregations ceased their activities and abandoned their buildings. High taxes and repression also contributed to the dereliction of the churches in this period. The abandoned churches were transformed into warehouses, workshops, kiln houses, gyms, cultural centres and concert halls. Even the establishment of cultural institutions in church buildings often led to the destruction of the sacred interior. While the church organ and its façade were often preserved, the altar and its retable were treated as a nuisance. An insight into the attitude of Latvian society to religious buildings and sacred interiors can be found in the description of the Pūre church: “In 1967, during the filming of certain episodes of the film “When Rain and Winds Strike the Window” by A. Brenčs for the Riga Film Studio, the organ and stained-glass windows were destroyed and the altarpiece was removed” (Mašnovskis 2007a, 207). In total, during World War I and World War II and as a result of the Soviet atheistic ideology, about 60% of the interiors of Latvian Lutheran churches were damaged or permanently lost.

THE SACRED INTERIOR OF THE BIĶERNIEKI CHURCH

The church of Biķernieki had a similarly tragic history, as a result of which the surviving fragments of the church interior are no longer located in the church itself, but in the collection of the Rundāle Palace Museum (hereinafter RPM). According to Pastor Klepers’ report, available at the National Heritage Board of Latvia, in 1926 the church was renovated, the interior, pews and altar were repainted and a new pulpit was installed (VKPAI 6645 861-43-KM, 17). In 1930, the Board of Monuments inspected the Biķernieki Church and prepared a description of the condition of the wooden sculptures there (VKPAI 6645 861-43-KM). The following information can be found on the pages of the inventory:

1. elements of the interior of the church of Biķernieki: altar - wooden, painted light grey-brown, capitals of columns and ornaments - gilded. Two wood-carved figures of angels above. Wooden pulpit with an angel on the upper edge near the window (VKPAI 6645 861-43-KM, 1).

2. Organ balcony sculptures - figures repainted after the war, wood, painted brownish grey and gold (VKPAI 6645 861-43-KM, 4).

On 27 January 1932, the Biķernieki Church with all its furniture and furnishings was included in the list of monuments under state protection (VKPAI 6645 5686, 4).

After the Second World War, in 1967, the congregation was closed (Chronicles of the

Congregation) and it was reopened only on 18 February 1989, when the first religious service was held (NCPAI 6645-5686, 7). In the interim, the church premises were used for storage, as well as for a stained-glass workshop "Māksla" (Fig. 1).

A year after the church was closed, the interior of the church was vandalised, which

Fig. 1. Interior of the Biķernieki Church. On the left, the church interior in the 1960s-70s (photo from RPM collection). On the right, the interior after the congregation closed (photo from http://bikerudraudze.lv/bikeru-dievnams/).

resulted in the loss or damage of several sacral artworks. A survey of the church premises revealed that the figures of the angels from the organ balcony and 4 vases from the barrier of the altar had been damaged. On 23 July 1970, the preserved art objects were handed over to the RPM and the Sigulda Regional Research Branch of the Dole History Museum (RPM, Act).

In 1979, the Riga Architectural Monuments Protection Inspection included the Biķernieki Church in an additional list of architectural monuments of local importance. The Director of the Decorative Arts workshop was informed of this and was obliged to maintain the building of the Biķernieki Church in proper order and not to allow any further damage or illegal reconstruction (VKPAI 6645 5686, 14).

The information about the history of the Biķernieki Church available in the institution for the protection of cultural heritage ends in 1991, when the Scientific and Methodological Council of the Rundāle Palace Museum drew up recommendations for its restoration and renovation. They recommended that the altar should be reconstructed in its original appearance and proportions, with all the original elements and wooden sculptures reinstalled in their original places. This allows us to conclude that the original altar was not lost completely in 1991, and thus could be restored. The RPM also recommends the installation of 2 carved vases on the altar room balustrade (there were 4 according to the survey of 13 September 1968 (RPM 2316:1)), an angel figure on the pulpit and 2 angel figures on the organ balcony. The recommendations also included suggestions for colour probing and restoration of the previous polychromy. Despite the information published in the congregational chronicles about the funding received in 1992 from the German church of North Elbe, which was used for the renovation of the exterior façade and the interior, the recommendations made by the

RPM were not implemented. A new marble altar was made to replace the old one. Only the chandelier until then held in the collection of the RPM was placed in its original location in the church.

DIGITISATION OF THE SACRED INTERIOR

Today the RPM collection includes the following elements of the Biķernieki Church: the capitals of the columns, the base of the altar, the pulpit podium, the wall candlestick console and the angel's head from the organ façade. Of the original wooden sculptures, the following are preserved: decorative vases and several figures of angels – from the altar, organ balcony and pulpit. These were scanned with a three-dimensional (3D) scanner in the course of the research.

Digitisation is now understood as the scanning of documents or the photographic fixation of objects. When analysing a sculpture that has been photographed from several angles, one may get a wrong impression and miss an important detail because it has simply not been captured by the camera. For this reason, 3D scanning is the most effective way of digitising sculptures, as it captures the sculpture from all angles and allows it to be studied in detail. When sculptures are scanned, they must be scanned in parts and, using a 3D modelling program, these parts must be processed and combined into a single model.

When scanning, there are a number of nuances that need to be taken into account, depending on the colour and shape of the sculpture:

- Gilded parts are only partially scanned as gold reflects light.
- Black parts are partially scanned, leaving holes in the model.
- Scanning the deepest points in ornate drapery is difficult if the sculptor has created a very elaborate garment full of deep folds for the sculpture.
- If the sculpture cannot be scanned at an angle of at least 270°, its gesticulating limbs or wings may be difficult to put together. Gesticulating limbs, especially the sculpted figure's raised or bent arms covering its body, and the position of the angels' wings may interfere with a correct digitalisation of the sculpture.
- Distance between parts of the sculpture needs to be taken into account as each scanner has a minimum scanning distance, so problems are caused by body parts placed too close together, e.g., an arm, or a leg, placed too close to the body, making it physically impossible to scan a part of the sculpture.

Creating a digital model can be a quick process, taking only one or two days, but it would take much longer to create more complex models, as the process depends on the experience and skills of the person doing the scanning. Once the 3D model has been created, it needs to be exhibited. The web platform Sketchfab[1] serves this purpose.

1 The Sketchfab platform was created in 2012 with the aim of creating a website where 3D models can be uploaded and displayed for everyone to explore. Today, millions of models are published online by enthusiasts, artists, engineers, museums, schools and others. Once a 3D model is uploaded, it becomes available for viewing. The platform also offers Virtual Reality (VR) and Augmented Reality (AR) features. To display 3D models on Sketchfab, the article author has created a profile "Art History of Latvia" (https://sketchfab.com/ArtHistoryLatvia), which displays the created 3D models.

CREATION OF 3D MODELS OF THE BIĶERNIEKI CHURCH SCULPTURES

The RPM collection includes 4 decorative vases from the altar balustrade of the Biķernieki Church. The author of the current research has used two of these vases to create their 3D models - one restored (https://skfb.ly/oxQ8O), the other not (https://skfb.ly/oxQpZ) (Fig. 2).

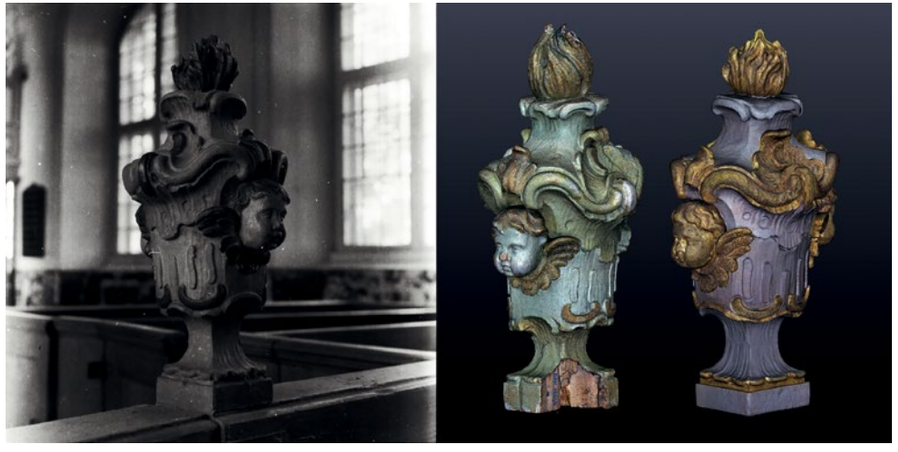

Fig. 2. Altar barrier vases. On the left a vase from the interior of the church (image from the RPM collection, 1968; photo Mārcis Leopolds Kļaviņš). On the right, 3D models of the vases - on the left the unrestored vase, on the right, the restored vase (S. Bitko).

The wooden vases were originally painted white and gilded, but later took on a greenish-brown hue.

In the 18th century, altarpieces were painted in a limited number of colours, while altar figures, reliefs, etc. were usually gilded. Homogeneous colouring highlighted the colour of the built-in altarpiece (Kampe 1931, 292). The wooden sculptures in the Biķernieki Church most probably got their new colour in 1926 after the repainting of the church interior (VKPAI 6645 861-43-KM, 17).

It should be emphasised that all the wooden sculptures had been light brown before the restoration; for example, the figure of the angel from the pulpit (https://skfb.ly/oxCFG), which shows that the congregation took care to ensure that the sacred interior gave the impression of unity (Fig. 3).

The RPM collection includes two sculptures of angels from the organ balcony. One of them is unrestored: it is missing both wings, the left arm and the left leg. The other sculpture is intact (Fig. 4, left: before restoration) and it has been restored and exhibited in the RPM's 'From Gothic to Art Nouveau' collection. This sculpture has been used to create the 3D model (Fig. 4, right) (https://skfb.ly/oyE9t).

In actual church interiors or in their photographs, the sculptures are perceived in their entirety. On the other hand, a 3D model allows you to study the sculptures in detail – the facial features, the body structure, the fall of the clothes or the ways in which the sculptor has created the sculpture's wings or the fingers and toes. Currently, all the sculptures of the

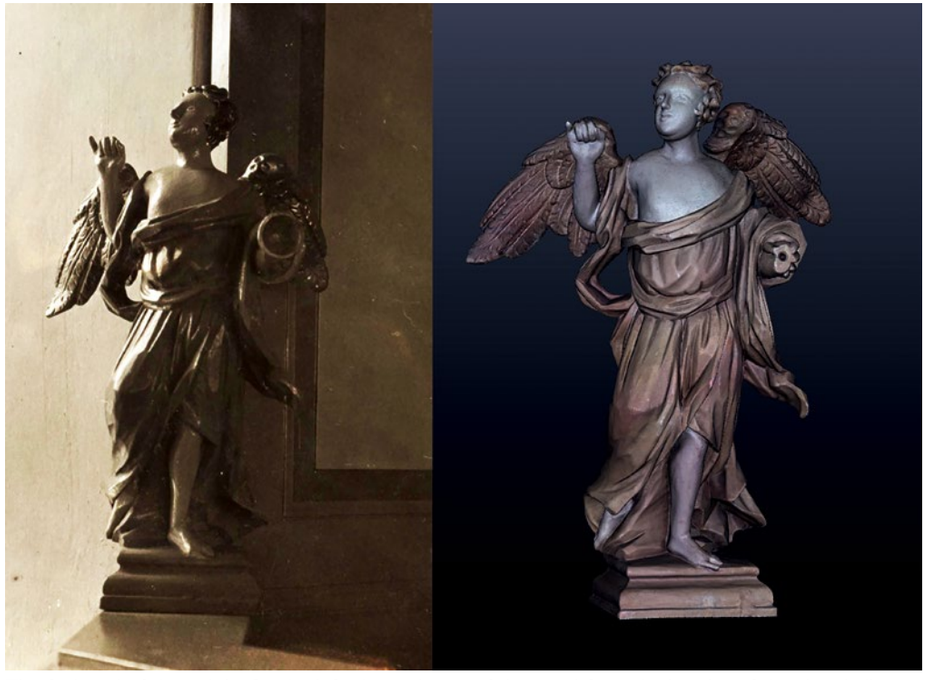

Fig. 3. Angel of the pulpit. On the left, the sculpture of the angel from the interior of the church (image from VKPAI file no. 6645 861-43-KM). On the right, the 3D model (S. Bitko).

Fig. 4. Angel of the organ balcony. On the left, the sculpture of the angel from the interior of the church before restoration (image from VKPAI file no. 6645 861-43-KM). On the right, the 3D model (S. Bitko).

Biķernieki Church are attributed to the sculptor Jakob Ernst Meyer (from Danzig). However, there are significant differences in their construction, which raises the question whether they were created by the same sculptor.

THE PROBLEM OF AUTHOR IDENTIFICATION

Studying 18th century Baroque altars in Riga, the historian P. Kampe has discovered that: "In Pastor Ravensberg's memoirs we find a note from which we can see that the carpenter Karl Gottlob Appelbaum (from Radeburg) 'made almost all the altars that have been made here (in Riga) in the last several years (written in 1769), such as: in Olaine, Jesus and Biķernieki churches.' The altar was consecrated in 1766" (Kampe 1931, 266-269).

The name of the woodcarver Jakob Ernst Meyer appears in written sources in connection with the altar of St John's Church in Riga, where he worked together with the above mentioned carpenter K. G. Appelbaum (Kampe 1931, 262). The altar retable has survived to this day and is still in the church. According to Kampe, the structure of the altar of St John's Church in Riga has similarities with the altar of the church in Biķernieki. The final volutes of both altars have angels, which Kampe saw as similar in the arrangement of their wings and in the folds of their clothing (Kampe 1931, 267). Perhaps for this reason, Jakob Ernst Meyer is identified as the sculptor of the church interior in Biķernieki. The name of the woodcarver is not mentioned in other written sources. It is mentioned neither in the RPM archive documents, nor in the transcripts available at the RPM from the Latvian State Historical Archives, nor in the documents of the archives of the National Cultural Heritage Administration.

Besides the angel sculptures of the altar retable, the Rundāle museum holds the angels from the organ. Unfortunately, there is not much information about the organ of the Biķernieki Church. According to F. Tilling, in the 1870 - 1880s, thanks to donations and a speech by the church inspector, the church in Biķernieki acquired a new organ (RPN, 6720:3). The replacement of the old organ with a new one in the 19th century explains the presence of the angelic figures on the organ balcony. They had probably been placed on the previous organ's façade, but did not fit visually there after the new instrument was installed, so they were preserved by being moved to the organ balcony (Fig. 4). This is also evidenced by the inventory of items available in the RPM archives, dated 13 October 1968, prepared by Pastor Kalniņš. It mentions: "organ façade; four angel figures and one head (from the old façade); wood, painted" (RPM 7540:4). There is no evidence of the original visual appearance of the organ façade, but assuming that K. G. Appelbaum worked together with J. E. Meyer on the altarpiece, it is possible that both were also the authors of the original organ façade.

According to Kampe, the organ façade of St John's Church in Riga was also made by K. G. Appelbaum[2] and installed in 1761 (Kampe 1931, 266). A 'Donation plaque for the new organ' has been preserved in St John's Church in Riga. It is a thick copper plaque with an engraved drawing of the organ and a text in Latvian. On it you can read a solicitation for donations for the construction of a new organ. The congregation had seen and heard

2 K. G. Appelbaum was a carpenter, while J. E. Meyer was a sculptor.

Fig. 5. A Donation plaque from St. John's Church in Riga (image after post-processing, personal archive of S. Bitko).

about the sonorous instrument of St Jacob's Church in Riga, completed in 1760, and wanted a similar one for themselves, so the plaque above the text shows the organ façade. The fundraising proved successful and the organ was built in 1761. The plaque has darkened over time and the image is difficult to see, so the author of the article has post-processed the image to bring out the drawing (Fig. 5).

Today, it is only possible to guess what the original organ façade of the Biķernieki Church might have looked like. However, analysis of the stylistic features of the organ façade in the second half of the 18th century and of the works of both masters in other churches in Riga indicates that it could have been similar to the one depicted on the "Donation Plaque" in St John's Church.

The organ façade of St Jacob's Church has been preserved and is available for more

Fig. 6.1.

Fig. 6.2.

Fig. 6. Angels from the organ façade

detailed analysis. On its pipe towers there are 4 sculptures of angels playing music, two below and two above.

The angels at the top (Fig. 6 [6.1]), depicted playing drums, bear a clear resemblance to the angels of the Biķernieki Church organ balcony. The resemblance is in the pointed nose, the curls of the hair and the dimples of the cheeks. The angel has very peculiar facial features and lacks the usual childish chubby features. The angel positioned lower in the façade is differently sculpted (Fig. 6 [6.2]). It has the facial features of a baby, and its face and body are made in a more realistic manner.

Comparing the angels on the organ façade of St Jacob's Church in Riga (Fig. 6) with the sculpture of the pulpit angel in the church of Biķernieki (Fig. 3), it is possible to see differences in the style of the execution of the sculptures, which indicates the work of several sculptors. This means that the sculptor Jakob Ernst Meyer did not work alone, but that several sculptors worked in the same workshop. The analysis of the altar angel sculptures of St John's Church in Riga and of the altar of the Biķernieki Church requires further elaboration.

VISUALISATION OF THE LOST SACRED INTERIOR

Using new technologies, such as augmented reality (AR), it is possible to visualise 3D models of sculptures in the user's environment in real time. The Sketchfab platform offers not only the possibility to view models on the internet, but also AR features. The system functions according to the following principles:

- a QR code can be printed for each 3D model;
- the QR code must be scanned with a mobile phone;
- the application offers a scanned surface on which to place the model;
- after downloading the model it is virtually placed in the selected location;
- the 3D model can be viewed via the mobile phone screen (Figure 7).

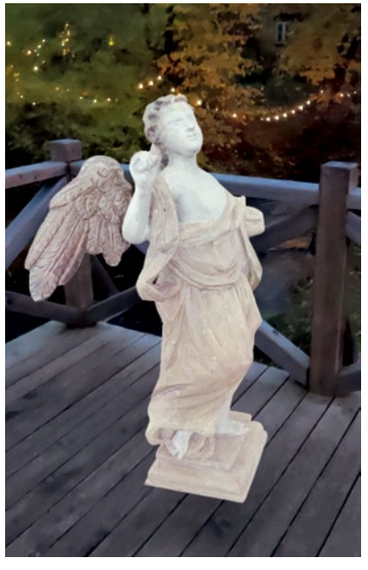

Fig. 7. AR view of the Pulpit Angel sculpture 3D model

To realise this option, important prerequisites must be taken into account for the representation of 3D models, where the most important is the size of the model in megabytes (MB):

1. After scanning the QR code, the model is downloaded via the mobile internet, so a fast internet connection must be available to minimize the downloading time. The larger the model, the longer the downloading time.

2. Internet traffic is used to load the model, so the amount of mobile internet available on the phone is an important factor so that the available limit is not used up after the models have been loaded for viewing.

Using augmented reality, the 3D models of the sculptures can be displayed in their original location, for example in the current interior of the Biķernieki Church. In this case, the most important risk factors should be taken into account: slow internet coverage indoors, limited internet on the end-user's phone, mobile phone model, etc.

FUTURE RESEARCH: ART ARTEFACTS AS 3D MODELS

The creation of such 3D models provides an opportunity to preserve our cultural heritage for future generations and to make new discoveries in art history.

In order to initiate large-scale digitisation, several aspects of creating 3D models need to be taken into account:

- A specialised 3D scanner is needed to create the model.

- Scanning and creating 3D models is not a simple process like scanning documents or photographing objects, which could be done by any museum employee with a little training. Experts in their field should be involved in the creation of 3D models.

Taking both of the above considerations into account and extending digitisation methods to the creation of 3D models will open up new prospects in the field of research in art history. The new digital technologies will attract viewers, especially young people, and help focus their attention on artistic values.

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INSTITUTIONAL CRITIQUE IN THE CONTEXT OF AUGMENTED REALITY (AR): ANALYSIS OF GINTS GABRĀNS'S (B. 1970) *THE FINAL GREAT OPENING* (2020)

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ABSTRACT
The COVID-19 pandemic seriously affected the entire cultural ecosystem: from social distancing measures to the closure of many art institutions. Despite the extremely difficult circumstances, the pandemic showed art institutions and artists the potential to expand into the digital world via virtual exhibitions, digital discussions, online viewing rooms and faster digitalization of collections, etc. Augmented Reality (AR) is one of the digital tools that is becoming an increasingly familiar feature of the Latvian art scene. It has also been widely used in many other areas, such as medicine, design and tourism. AR has the potential to democratise art through technology, allowing anyone to create anything, exhibit it all around the globe and share it with the public anytime and anywhere.
In this paper, I analyse Gints Gabrāns's (b. 1970) AR artwork The Final Great Opening (2020), which depicts usual visitors of contemporary art exhibition opening ceremonies in a deformed and grotesque visual form. His transformed Augmented Reality photographs draw attention to the established hierarchy in art institutions, criticizing their power to control artists' access to exhibition spaces. The chosen medium of AR expands the thematic setting, offering new opportunities for the democratization of viewership.
Keywords: *institutional critique, Augmented Reality, activism, digital activism, contemporary art.*

INTRODUCTION

The COVID-19 crisis has accelerated digital transformation trends around the globe, as evidenced in the development and expansion of digital infrastructure. Despite the extremely difficult circumstances, the pandemic also showed art institutions and artists in Latvia the potential to expand their presence into the digital world via virtual exhibitions, digital discussions, online viewing rooms, more rapid digitalization of collections[1] and other means. For example, during the first year of the pandemic, the Latvian National Museum of Art hosted its first digital video art exhibition[2], developed its first fully digital educational programme[3] and in all likelihood held its first full staff zoom meeting. Thanks to the outstanding support of the State Culture Capital Foundation, where for the first time the whole programme was dedicated (with an increased budget) to the development of digital environment[4], many innovative and sustainable projects were created and they have been evolving ever since. One of the digital possibilities that has yet to be explored in the context of contemporary Latvian art is Augmented Reality. I will argue that as a medium AR art has the potential to resist the rules dictated by art institutions and to democratise art through technology allowing anyone to create anything, exhibit it all around the globe and share it with the public anytime and anywhere.

AUGMENTED REALITY

Augmented Reality is defined as a set of visualization and interaction systems that permit the perceptual overlay of virtual information (including photos, videos, 3D graphics, texts, sounds) on top of material reality, in real time, site-specifically, and in an interactive manner. AR has the capacity to articulate a hybrid space that seamlessly merges real and virtual elements into one (Avram 2019, 3). A new layer of information is added to the existing world in Augmented Reality, which creates the impression that the integrated objects are part of the existing environment. In this case, we could also argue that AR media create a heterotopia, which is a concept introduced by the philosopher Michel Foucault to characterize places in every society that "are something like counter-sites, a kind of effectively enacted utopia in which the real sites, all the real sites that can be found within the culture, are simultaneously represented, contested, and inverted" (Foucault 1986, 24). Foucault brings together the concepts of utopia and heterotopia in the mirror metaphor: "The mirror is, after all, a utopia, since it is a placeless place. In the mirror, I see myself there where I am not, in an unreal, virtual space that opens up behind the surface; I am over there, there where I am not, a sort of shadow that gives my own visibility to myself, that enables me to see myself there where I am absent: such is the utopia of the mirror. But it is also a heterotopia in so far as the mirror does exist in reality, where it exerts a sort of counteraction on the position that I occupy. From the standpoint of the mirror, I discover my absence from the place where I am since I see myself over there. Starting from this gaze that is, as it were, directed toward me, from the ground of this virtual space that is on the other side of the glass, I come back toward myself; I begin again to direct my eyes toward myself and to reconstitute myself there where I am. The mirror functions as a heterotopia in this respect: it makes this place that I occupy at the moment when I look at myself in the glass at once absolutely real, connected with all the space that surrounds it, and absolutely unreal, since in order to be perceived it has to pass through this virtual point which is over there" (Foucault, 1986, 24). According to Foucault, the mirror offers the viewer an experience that is both unreal and real. Similarly, AR brings together virtual and digital worlds. It moves away from the illusion of digital dualism, that is the idea that the online world is somehow separate from the "real world", or in this case that there is a real world and an online world. AR breaks this dualism and builds on the deep interconnectedness of the physical and digital worlds, making it possible to

1 For example, the Latvian National Museum of Art digitized part of its collection: https://www.makslaskolekcija.lv

2 Available at: https://noba.ac/en/exhibition-posts/collection-of-video-art-of-the-latvian-national-museum-of-art/

3 Available at: https://www.lnmm.lv/latvijas-nacionalais-makslas-muzejs/jaunumi/makslas-muzeji-piedava-no-zimes-inovativu-attalinatas-izglitibas-programmu-skoleniem-65

4 The focus of the State Culture Capital Foundation financial support program during the Covid-19 pandemic was the development of cultural projects in digital environment.

create coexistent spatial realities. AR becomes a freely accessible space for artists to "install, revise, permeate, simulate, expose, decorate, crack, infest and unmask Public Institutions, Identities and Objects previously held by Elite Purveyors of Public and Artistic Policy in the so-called Physical Real" (Manifest.AR 2011).

The quoted manifesto of the artist collective Manifest.AR is a major turning point in AR art and it underscores its potential to make art institutions more accessible to artists. Historically, Manifest.AR was the first artist collective that started using AR to create art and activist works. The group was formed when AR creation first became possible on smartphones (Geroimenko 2014, 7). The collective originated in the 2010 "We AR in MoMA" intervention. Mark Skwarek and Sander Veenhof realized that they could challenge the extreme exclusivity of the Museum of Modern Art by placing art works inside and around the museum, and invited selected artists to participate without MoMA's management team knowing anything about it. Thus, it is possible to argue that AR art originates from a kind of guerrilla activism, exemplified by the intervention at MoMA, where AR artists made a statement against elitism and exclusivity in the art world. They did so in an effort to make the fine art world less snobbish and more accessible not only to the public, but also to artists themselves. In what follows, I apply the concept of "institutional critique" to such AR interventions.

AUGMENTED REALITY AND INSTITUTIONAL CRITIQUE

The term "institutional critique" describes a variety of distinct artistic practices and discourses that first appeared at the end of the 1960s and have been evolving ever since. As the art historian and editor of the book *Institutional Critique. An Anthology of Artists' Writings* Alexander Alberro points out, institutional critique has taken various forms, including boycotting exhibitions, organizing public meetings and sit-ins, disseminating pamphlets, producing false identification cards to enable free entry into museums, and performing actions and other demonstrations that sought to radically transform the dominant art institutions (Alberro 2009, 5). The term first appeared in print in the British conceptual artist Mel Ramsden's work *On Practice* in 1975. In the said work, Ramsden criticizes the instrumentalization of art in general and the hegemonic dominance of the New York art world in particular. He observes that, "the administrators, dealers, critics of his time had become "masters" and the New York artists "imperialist puppies"" (Ramsden 1975, 170). The capitalist structure of the art market has been completely internalized by all those who participate in it, thereby making resistance to its hegemony close to impossible (Alberro 2009, 8). A notable example of institutional critique in contemporary art is the "Liberate Tate" artist collective, which was founded in 2010. Ironically, the group was born during a masterclass organized by the Tate Modern Museum itself. The group aimed to "free art from oil", focusing on the Tate Museum of Art, and its relationship with British Petroleum as a corporate museum sponsor. "Liberate Tate" has become an internationally renowned group of artists who create mostly performative works of art highlighting the relationship between state cultural institutions and oil companies. In 2017, the Tate Museum ended its collaboration with British Petroleum.

The concept of "institutional critique" is relevant to AR media themselves. Using the emerging technology of mobile Augmented Reality, AR interventions geolocate virtual artworks inside the normally curatorially closed exhibition spaces via GPS coordinates and open up possibilities to exhibit virtual artworks and criticise the oppressive role of art institutions. Unlike physical art interventions, AR artworks cannot be removed or blocked by curators or other authorities, and will remain at selected locations for as long as the artist desires. AR artists exploit site-specificity as an integral part of their artworks, while simultaneously questioning the role played by museums and art galleries in canonizing certain works of art, and the power of the curator as a gatekeeper to control access to the spaces that consecrate works of art as part of the high art canon (Geroimenko 2014, 9). In this context, AR media envision alternative institutions and mechanisms for curating and displaying art.

What needs to be further considered is the potential of AR institutional critique to redefine the media within the contemporary Latvian art scene where there is a constant shortage of exhibition spaces and a long waiting list to show your work.[5] As the philosopher Jānis Taurens argues in one of the rare articles dedicated to manifestations of "institutional critique" within contemporary Latvian art: "Latvian artists do not so much criticise the policy of the institutions, but rather their absence which is caused by the inaction of other institutions, most likely emphasising the government's decades-long failure to build a national contemporary art museum in Latvia" (Taurens, 2018). It should be noted that the topic of institutional critique is rarely touched upon by contemporary Latvian artists. As an exception we can mention Arnis Balčus's (b. 1978) exhibition *After Exhibition* (2018), Gundega Evelone's (b. 1988) *Contemporary Art Museum for Ants* (2018) and Ivars Grāvlejs's (b. 1979) *Unknown Latvian Photography* (2016).

GINTS GABRĀNS'S *THE FINAL GREAT OPENING* IN THE CONTEXT OF AUGMENTED REALITY AND INSTITUTIONAL CRITIQUE

Gints Gabrāns is among the artists who started their careers during the 1990s, creating installations, videos and internet art projects whose aesthetics was new, challenging public perception and focusing on the relationship, interaction and confrontation between art and reality. In 2015, Gints Gabrāns created SAN which is a GPS based Augmented Reality mobile application. It allows the formation of GPS-based large-scale virtual structures that can be seen on a smart device as 3D objects in Augmented Reality. They can be viewed in real space from various angles and you can move through them (Gabrāns, 2015). On this app, Gabrāns has created many works of art using SAN AR platform[6] as his virtual gallery, with the help of which the artist can exhibit works wherever he imagines, bypassing the dichotomy of the centre and periphery and redefining the hierarchical structure of the institutional art spaces.

In 2020, Gints Gabrāns created the AR exhibition *The Final Great Opening* at Dubulti Art Station, which is located in a functioning railway station building. The visual base material for the exhibition comes from 2000 photographs taken at the openings of contemporary Latvian art exhibitions. They have been used as the raw material for training the artificial intelligence neural network, in order to create generative visions of artificial intelligence. As the artist explains, "These newly created images are used in the exhibition works, which not only allow us to be introduced to and enjoy the strangeness of the unfamiliar view, but can also help us to see and discover hidden patterns and structures in our man-made world" (Gabrāns, 2020). The question remains: what are these hidden patterns and structures? The exhibition at Dubulti Art Station was organized shortly after the declaration of the state of emergency due to the Covid-19 pandemic. Floating AR images show regular visitors to exhibition

5 In 2022, the Museum of Contemporary Art has still not been built in Latvia, and the exhibition hall "Arsenāls" has been under reconstruction for a long time. The Latvian National Art Museum has partly compensated for this lack. However, its involvement in exhibiting and researching contemporary art is sporadic.

6 More information is avalable at: https://www.gabrans.com/SAN.php

openings, mostly representatives of the Latvian art scene, myself included. Gints Gabrāns developed a subtle irony about the closed and often haughty exhibition opening rituals in the art world, which had at that point temporarily ceased due to the pandemic. The transformed Augmented Reality photographs of visitors to opening ceremonies not only floated in AR at the railway station, but also around the city of Jūrmala, as well as elsewhere after the exhibition. The pictures seem to have stepped out of Francis Bacon's paintings - blurred, deformed and grotesque in form. The institutional representatives, whose faces have been distorted, have turned into anonymous, virtually unrecognizable, public figures. However, despite their tragic appearance, they amuse the viewer with their comically exaggerated features and make one question not only the values of the represented group, but also those of the institutional apparatus to which they belong. The Final Great Opening draws attention to the established hierarchy within art institutions, prompting one to think about how artistic projects are funded and about the advantages that some artists have whereas others do not. It could well be that the hierarchy in the art world, manifest, among other things, in who gets to attend exhibition openings, remains hidden from the public which does not circulate in the Latvian art scene bubble, but Gabrāns's ironic and critical commentary serves to draw the public's attention to that part of society which is its subject and to the hierarchy that exists in it. The deformed images of his AR project reflect upon the blurry systems of preference and bias that dictate who rules the art world. According to Gabrāns, "If I was to place a physical sculpture somewhere, I would need to abide by the local laws, sign commercial contracts, or coordinate my activities with local councils and governments. When I initially started to create projects in SAN, the whole world was my playground. My experimental polygon was some of the world's largest museums" (Gabrāns, 2022). In this case, the AR media allows one to imagine an alternative institutional and hierarchical system where the artist is the main actor free from institutional pressure.

I also want to comment on Gints Gabrāns's most recent work of art, *Super-Galleries*, an Augmented Reality piece that debuted at the Venice Meta-Space at the same time as the 59th Venice Biennale of Art. According to Gabrāns, "The *Super-Galleries* are presenting the 'antiZombie' collection, a curated section of memes thematically devoted to the Russian invasion of Ukraine, with references to historical events. These memes take action against Russian aggression, the induced war and their propaganda machine" (Gabrāns, 2022).

Two of the SAN Super-Galleries are located in the Giardini Gardens: the AntiZombie Gallery #1 is located above the Russian Pavilion and the Ctrl-Z Gallery is above the Central Pavilion; the third and largest anti-Zombie Gallery #2 is located above the Arsenal, covering its entire territory. With the help of AR, Gints Gabrāns is able to respond immediately to the war in Ukraine and spread his message despite being hundreds of kilometres away from Venice. This could be perceived as a case study in digital activism. This work of art also reflects on the Venice Biennale as an institution, i.e. one of the most prestigious art events in the world. However, the key question about the Venice Biennale 2022 remains: where does Russia's violent invasion of Ukraine fit in it? Ukraine was being bombarded by missiles while the hip contemporary art crowd browsed the Biennale displays. This is an open question and most definitely Gints Gabrāns's *Super-Galleries* has yet to be analysed in terms of both AR and institutional critique.

CONCLUSION

To conclude, Gints Gabrāns uses his AR SAN app as a medium, form and conceptual tool to address issues related to art institutions' control of the selection of artworks to be exhibited and of the spaces where they are exhibited. His projects also tackle the issues of inclusivity and exclusivity, and the autonomy of the artist in the light of the possibilities offered by the new medium of geolocative Augmented Reality. The AR medium enables the artists to realize their creative projects regardless of the decisions and opportunities of art institutions. Thus, both AR and the themes it enables the artist to explore provide both a platform and a wide range of opportunities for institutional critique.

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ARCHITECTURE OF THINGS: SPATIAL PRACTICES OF COLLECTING AND HOARDING IN LATVIA

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ABSTRACT
The article was prepared as an introduction to a broader study of peculiar and specific contextual phenomena in the synergy of man-made environment, culture, and nature in Latvia. The multidimensional study focuses on various spatial practices – daily routines, rituals, and other everyday activities in people's lives – while this paper in particular focuses on the practices of hoarding, collecting and storing in Latvia. On the one hand, this phenomenon, characteristic of different social groups embedded in historical contexts, traditions and individual daily routines, illustrates modern consumerism as well as social attitudes towards property and the environment in general; on the other hand, it is also a psychiatric diagnosis. Hoarding is linked to mental disorders, negligence, or lack of self-care; very often it is also a way of life rooted in certain notions of order, concerns for economic well-being, and fear of hard times.
In contrast to the negative side effects associated with hoarding, in the contemporary context this social anthropological phenomenon can hypothetically be given an interpretation from the point of view of the theory of new materialism. We can also discuss hoarding in connection with life-cycle economics, the prudent use of resources, alternative approaches to the acquisition of resources, and the preservation of the environment as a whole. In this paper, the research strategy is highly interdisciplinary, synthesizing arts, social sciences and humanities. Expanding on the topic of hoarding, the article examines several artistic projects, when by re-using personal object archives, people's accumulated things, worn-out or discarded objects, new works of art are created. Planned further research aims to contribute to the exploration of local identity and customs in relation to sustainability practices.
Keywords: *environment, resources, spatial practices, local narratives, hoarding, identity*

This article was prepared as an introduction to a broader study of peculiar and specific contextual phenomena in the synergy between the man-made environment and culture and nature in Latvia. The multidimensional study focuses on various spatial practices, such as daily routines, rituals, and other activities in people's everyday lives. The study draws on Pierre Bourdieu's notion of "habitus", that is "the practices of everyday life that reproduce the materials conditions of the society" (Rivkin and Ryan 2017, 1592) along with their accompanying stories that have been important in shaping the local cultural landscape against the backdrop of 20th-century history. As Bourdieu argues, "the habitus, the product of history, produces individual and collective practices, and hence history, in accordance with the schemes engendered by history" (Bourdieu 1977, 754). As our social practices are located in space, the current study also makes use of Lefebvre's explorations of space and spatiality. According to Lefebvre, "spatial practices consist in a projection onto a (spatial) field of all aspects, elements and moments of social practice" (Lefebvre 1991, 8). For Lefebvre, space is not just a "passive locus of social relations", for as "knowledge and action" it plays an active, "operational or instrumental" role in the existing mode of production (Lefebvre 1991, 11). The study aims to explore social experiences and habits that create the surrounding spatial environment and shape our perceptions of it.

The strategy of this study incorporates an interest in an objective (vernacular) approach to creating an environment, as well as in everyday spatial practices and environmental culture, combining references to the concept of **circular economy** with the research methods used in the social sciences and the humanities (literary analysis, sample selection, original interviews and audiovisual documentation). This paper in particular focuses on the practices of **hoarding, collecting, and storing in Latvia** – a phenomenon characteristic of different social groups embedded in historical contexts, traditions, and individual daily routines. On the one hand, this phenomenon illustrates present-day consumerism, as well as social attitudes towards possessions, things one has accumulated as their own property, the surrounding material environment and the general living environment, but, on the other hand, it can also assume the form of uncontrollable mental health problems and receive a psychiatric diagnosis.

The things and objects we collect are not limited to having a **functional, resource-related and economic value**. They are also a source of emotion and **sentiment** holding significant **aesthetic** value for the individual. People usually opt to keep things for the following **three chief reasons**: 1) sentimental attachments; 2) use value; 3) aesthetics (Steketee, Bratiotis 2020). The psychoanalyst and author Salman Akthar has described the ways in which we engage in a dialogue with things, as well as our emotional attachments to things and their influence on the way we feel and think (Akhtar, 2005). Things are connected to one's lifestyle, specific places, and events. The memories, traditions, and concepts tied to things shape not only an individual's personal memory but also the collective memory of any given society. However, an exaggerated accumulation of things can indicate an obsession, and in this case it is referred to as a psychological problem. Psychotherapists say that this is based on an obsessive-compulsive disorder, a feeling of discomfort and anxiety linked to hoarding things and being unable to throw them away. This is also accompanied by "beliefs about objects as a source of identity" (Tolin *et al*. 2014).

Research on the habits of hoarders has hitherto usually been conducted in the areas of psychology, economics and other social sciences. **Hoarding disorder** is a diagnosable and treatable behavioral disorder that can be linked to mental health issues, self-neglect, and lack of self-care. Very often, it becomes a lifestyle that is based on a specific understanding of the way things are, on worry about one's economic well-being and being able to provide for oneself, as well as on fear about trying times [*nebaltās dienas*]. Because they "might come in handy", things accumulate in households, closets, pantries, barns, attics, hallways, balconies, and backyards. There are different types of relationships one can create with the world of things: in general, the accumulation, storage, and saving of things helps people orient themselves in the world and plan for their future (Peebles 2021). Nevertheless, social perceptions about hoarders are generally negative, with their lifestyle being seen, not without reason, as one that is characterized by uncleanliness, neglect, untidy surroundings and a cumbersome daily life. Hoarding is a phenomenon prevalent across social groups of different ages. Even though data suggest that it is more prevalent among seniors, hoarders can come

from disparate socioeconomic backgrounds and have different daily routines. According to the American Psychiatric Association, people with a hoarding disorder have persistent difficulty getting rid of, or parting with, possessions, no matter what their actual value is, due to a perceived need to save the items and the potential suffering that parting with them entails (Tolin *et al*. 2014). In the long term, hoarding and accumulation leads to excessive clutter and want of order, but people with hoarding disorders find it difficult to get rid of, donate, recycle or otherwise part with their possessions even when they have too much stuff lying around (Steketee, Bratiotis 2020). Research suggests that about 4 to 5% of the public have a hoarding disorder (Steketee, Frost 2020). When referring to hoarding practices, two similar but different habits, namely **saving and collecting**, should be differentiated. **Saving** is a tendency, not a disease or a mental health problem. Even people without a mental health problem have a tendency to save, which has been thoroughly analyzed by Gustav Peebles in a paper researching the dialectical relationships between hoarding, collecting, and saving from an anthropological point of view (Peebles 2021). The American Psychiatric Association (2013) emphasizes that **collecting** likewise does not amount to a psychological problem or a hoarding disorder. Collectors usually purchase or obtain things selectively, in an organized, conscious, and focused manner. As a matter of fact, there are significant differences between hoarding and collecting – collectors are able to clearly state their reasons for obtaining new things, which is part of social activities directed towards obtaining a particular object. It is not linked to suffering, anxiety or other disorders usually experienced by people with a hoarding disorder (Steketee, Bratiotis 2020).

Can collecting and saving things be seen as a spatial practice particular to, and characteristic of, Latvia's population? A good example of hoarding in Latvia is the characteristic look of present-day facades of Soviet-era multistory apartment buildings, which feature balconies cluttered up with household goods, furniture, or personal belongings, with the few extra square meters of space used for storage or to hang out the laundry to dry. This is illustrated excellently by Ieva Raudsepa's series *Daudzdzīvokļu nami* (*Apartment Buildings*, 2016-2017), which she created for the exhibition *Kopā un atsevišķi* (*Together and Apart*), the Latvian entry for the Biennale Architettura 2018 in Venice. It reflects everyday practices of organizing one's living space and surroundings in the post-Soviet space. The descriptive concept of "the practical Latvian" [*praktiskais latvietis*] is widely used to refer to sharing practically-tested and ingenious advice about the ways of doing everyday tasks and accomplishing something with one's own hands. The idiomatic expression "trying times" [*nebaltās dienas*] meanwhile is used to refer to financial trouble looming in the immediate future, that is certain things, objects, and valuables will be necessary for survival. Despite the fact that, in the Latvian context, the practices of collection and storage – as confirmed by the psychotherapist Agnese Sperga, an Assistant Professor in the Department of Psychosomatic Medicine and Psychotherapy at Rīga Stradiņš University – are deeply informed by historical experiences, in particular the living conditions of Soviet-era poverty and deficit of consumer goods, it is not a trend characteristic only of Latvians (interview with Sperga from the author's archives). Meanwhile advice columns in 20th-century periodicals about the uses of old, worthless things warrant a separate study in themselves: "You can use two broken hair combs to create a nice pen holder for your writing-desk. An old toothbrush will last an entire year as a dish scrubber. Old boots can be used as book spines if you bind them. Children's boots can be gilded, filled with candy and used as a Christmas tree decoration. An old men's straw hat can be turned into a beautiful bread basket, particularly if the inside is coated with gum arabic" (*Zeltene* 1933). Likewise, Latvian newspapers testify to the existence of the so-called *Izejviela* [*Raw Material*] network of collection points during the Second World War. The network was frequently mentioned in newspapers, accompanied by

invitations to dispose of unneeded things and referring to valuables that can be made from waste during wartime: "The tailor's shop has already made about 100 sets of workwear for factory workers using worn soldiers' clothing [...] A bottle washing station has been made to supply pharmacies with vials. In one mechanical workshop, all the appliances, workbenches and tools have been gathered piece by piece or made from scrap. A truck has been made from scrap and handed over to the army. Bicycle frames will be made from scrap in the future. And maybe entire bicycles, too" (*Laikmets* 1942).

Regardless of whether they are related to mental disorders, lifestyle choices or economic circumstances, the practices of hoarding and collecting can be interpreted in a perfectly modern way through the lens of **new materialism** (Simms, Potts 2012) or **circular economy**. New materialist theory (Simms, Potts) is a concept that encourages the development of well-considered relationships between human beings and things. It was elaborated in 2013 by Ruth Potts, a British sustainable development expert, and the economist Andrew Simms. Materialism is a synonym for consumer culture, and by and large the critique of consumerism is nothing new. Potts and Simms speak of "new materialism" as a way of crafting respectful relationships with the "world of things", promoting general well-being and a life in harmony with the surrounding environment. New materialism seeks ways of reacting against escalating consumerism and replacing it with something different. The essence of it is simple: changing people's attitude towards things, caring about them, prolonging their lifecycle by fixing rather than throwing them away, becoming more engaged in individual production and manufacture, and buying fewer goods that have a fixed expiration date. The approach they advocate makes for opportunities to create innovative models of social and consumer relations, to engage in co-creation, and acquire different trade skills. In Europe and the world in general, active steps are now being taken towards a new, more sustainable way of using resources and a life in harmony with nature, the environment, and the planet, i.e. towards a **circular economy**. The term refers to a "model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible" (European Parliament). According to the approach taken in the circular economy, the life cycle of products is extended. Nothing should be discarded and every object should be used as fully as possible, returning it into another cycle of use and utilizing its components to make new products. According to the principles set down in the theory of new materialism and also according to the principles of the circular economy, commodities should be shared, fixed and recycled to facilitate the circulation of materials and spare parts in a closed loop. These practices as well as alternative approaches to the use of natural resources and to the preservation of the environment in general may impart a different meaning and a different value to the practice of hoarding and saving things. It is important that the user can use the product for as long as possible and that the object preserves its use-value even after its life cycle has theoretically drawn to an end. Accordingly, one of the principles of the circular economy is "zero waste consumption, which stipulates that nothing gets thrown away, since waste can be reused through repairs, taking apart and so forth" (Jēkabsone 2022). According to Simms and Potts, instead of living as a "throw-away society", we should move to a model in which value is produced by using a "cycle of circulation" in the use of things and materials: "repair, reduce, reuse, recycle and all the other appropriate actions prefixed with 're'" (Simms, Potts 2012). Similarly, in his last publication Graeme Brooker, a lecturer at London's Royal College of Art, offers 50 different words to describe the re-designation of things (Brooker 2021). To him, each of these words is an instrument chosen deliberately to spark associations. The words in his dictionary, such as *heritage(s), modification, waste, profusion (off-site self-storage UK), recycle, reuse, degrowth, repair*, have been chosen so as to best characterize the routines of

collection, storage, and reuse.

Gustav Peebles calls things "physical substances" and coins the expression "the reactivation of things" to refer to the practice of storing things for future use: "[...] hoards are everywhere and may well be a human "universal"; that is, upon closer inspection, it is likely that all societies have methods for storing away unused and dead things for future use, so that they can one day be reactivated and thereby sustain a social world" (Peebles 2020). The **reactivation of things** collected in the past is likewise evident in the creative practice of many artists, for example, in the way they reuse personal archives, things that others have collected, as well as worn-out or discarded found objects in order to create artworks or installations. During my preliminary research, several internationally and locally made artworks and projects caught my attention as directly related to the topic of my study. These artworks and projects are categorized according to their creators' approaches to reusing objects of various kinds, i.e. "valuables" and waste alike, and further described in four thematic parts that follow.

Research documentation. The photographer **Paula Salischiker** has tried to understand hoarders and has documented their houses. *The Art of Keeping* is a photo series started in 2011. Salischiker took photos of six houses in London and Essex after visiting a self-help group for people with a hoarding disorder. She photographed the houses of people who found it difficult to throw things away, since they made them feel safe. Things made these people feel safe, and they spent plenty of time taking care of their possessions. Nevertheless, the things that they had collected made their life difficult, taking over their living space and suffocating them as they grew ever more voluminous. There is an indirect correspondence between Salischiker's series of photographs and **Vilnis Vītoliņš's** project *100 istabas / Tā ir Latvija (100 Rooms / This is Latvia*, 2007-2011), which offers a glimpse of private living spaces of different people in Latvia, with some of them depicted surrounded by a rich and dense landscape of things. In a 2011 interview with the Rīgas laiks magazine, Vītoliņš emphasizes the fact that everyone has their own domestic environment that they either organize following their own aesthetic criteria or leave up to chance. The title of the series is quite revealing, as Vītoliņš basically portrays Latvia in the first decades of the 21st century. Each photo offers a view of private interiors featuring a compilation of individual objects. According to the art critic Vilnis Vējš, who wrote about Vītoliņš's photos in a review of his 2009 show *Privāts* (*Private*), there is "a lot of everything there, from striking interiors, things, and junk to the demonstration of the cutting edge of photographic technique" (Vējš 2009). One would like to lend credence to the authenticity of these private rooms, but, judging by the photographer's words and the decadent images themselves, one can surmise that they were staged and that the location of objects was manipulated. In both Salischiker's and Vītoliņš's works, people's homes are represented with the individual's personal space, things, and the persons themselves becoming an object of a research initiative that records an era, a private living space, as well as its owner's values and obsessions.

Taking stock of private archives. The contemporary Chinese artist **Song Dong** (b. 1966) has taken stock of his mother's home and artistically systematized the objects that had been hoarded there for the installation *Waste Not* (multiple exhibitions since 2005). Each of Song Dong's late mother's possessions displayed in the installation reveals a particular aspect of his mother's personality and lifestyle, evoking memories, emphasizing the transient nature of our lives, and testifying to the tenacity with which we hold on to the past. The work, first made in 2005 and exhibited in many different places since then, amasses about 10,000 domestic objects that the artist's mother, a hoarder, had collected throughout her life. The mother "rescued" everything she found, based on the Chinese philosophical approach *Wù jìn qí yòng'*, which can be translated as "non-waste" and which relates to survival tactics at the

time when the country was seized by poverty and fear due to political and social upheavals. In Song Dong's project, the possessions a human being had accumulated throughout her life have been arranged in neat rows and patterns on the floor. His project amounts to a powerful message about Chinese culture and memory as well as the sociopolitical conditions in China in the second half of the 20th century. The artist also intended to help his mother to overcome her grief for her husband, who had died suddenly in 2002, and to put her memories in order. In the Latvian context, one should single out **Monika Pormale's** stage design for the New Riga Theater play *Garā dzīve* (*Long Life*, 2003). It was "such a dense compaction of authentic, real objects that the film director Juris Poškus [...] called it surrealism" (Zieda 2010). The communal apartment which serves as the home of the play's protagonists, all of them senior citizens, is at the heart of the stage design for the performance. It features a record-high number of props. As Pormale recalls in an interview: "Many things that had belonged to private individuals, the actors and also my grandparents were brought [to the theater]. This provided the performance with the right atmosphere. It's wonderful to be able to give a second life to things. At some point there was the idea that this stage design could eventually retire from its life on stage to become part of a collection at an art museum, as a testimony to an era" (*Santa* 2021). The scenography of *Garā dzīve* likewise testifies to the artist's own obsession, the intent and necessity to collect the *right* things. Here, the assemblage of things does not serve as mere decoration or background; it is, instead, a carefully composed, almost authentic environment, a living space that illustrates the older generation's daily life, a great part of which consists of different routine activities related to these objects. Other stage designs by Pormale have also grown out of the "cosmos of things" (Zieda 2010). The authenticity of things Pormale seeks out for her performances is very important as she uses them in order to stage realistic environments, tell stories, and reconstruct memories.

Bricolage and interpretation. New works are being created from discarded and worn-out objects (waste), and several projects that do this also have a significant social and educational function. In 2020, as part of the international *WasteArt* project, the Institute for Environmental Solutions and its partners organized the traveling exhibition titled *PROM no acīm, PROM no prāta* (*NOT out of sight, NOT out of mind*). Its final location was the Tallinas Street Quarter in Rīga. The project and the exhibition aimed to motivate the public to become more conscious of, and attentive towards, consumerism and the management of household waste in their daily lives. The exhibition, curated by Evelyn Grzinich and Indrek Grigor, featured works by fourteen internationally recognized artists (Varvara & Mar Canet, Jacob Kirkegaard, Marta Moorats, Ansis Starks, André Avelãs, "The Laboratory of Microclimates" Annechien Meier & Gert-Jan Gerlach, Johanna Lohrengel & Gatis Kreicbergs, Ieva Krūmiņa, Geraldine Juárez and others). These works were created expressly for the project, making use of materials obtained from household waste, such as electronics, furniture, newspapers, telephones, plastic bags, clothing, etc. According to the curators, "even though the exhibition was made from waste, the artists have succeeded in creating high-quality artworks, making use of different materials and artistic media" (*Satori* 2022). A similar project, directed towards educating the public, took the form of an artwork in public space in the summer of 2021. After being commissioned by the Latvijas Zaļais punkts company [The Green Dot is a protected, internationally registered and widely used trademark of high packaging standard; Latvijas Zaļais punkts is a sub-licensee of the Green Dot trademark in Latvia], the artists **Mārtiņš Blanks** and **Pēteris Zilbers** created a large-scale installation in the square by the Riga Congress Centre. It was made from discarded objects obtained at a landfill. The installation was created with the goal of making citizens think about environmental issues in the context of conspicuous consumption, evaluate their

responsibility towards consumer goods, and pay attention to sorting and recycling waste. Within the thematic scope of this paper, the duo of artists **Claire Healy** and **Sean Cordeiro** should be singled out as having done definitive work in the domain of art that deals with hoarding. Their installation *Deceased Estate* (2004, Glashaus Gallery, Weil am Rhein, Germany) is a sculptural meditation about the things we collect during our lifetimes and the way they shape us. A different work of theirs, the installation *Hoard* (2005-2006), exhibits the entire contents of the Künsterhaus Bethanien studio, collected over a year.

Embodiment and corporeal experiences. The artist **Vika Eksta** took a number of self-portraits in an abandoned countryside house and created a series of photographs *Dievs Daba Darbs* (*God Nature Work*, 2018), which engage, conceptually, in the reactivation of an abandoned private archive. The idea of the project is based on Anna Brigadere's autobiographical trilogy about a woman's experiences in her childhood and early youth. In an interview with Arnis Balčus, Eksta says that "a house is like a natural archive with the things a person has collected over their entire lifetime". Using the clothes and other things she found in the house and spending many hours alone there, she attempted to embody different situations – a traditional lifestyle and its modern-day reflection – by depicting the life of a country woman from an earlier era (Balčus 2015). Eksta's work is about an intimate, even corporeal absorption, making use of another person's possessions, as if she were asking the question about what it would mean, physically, to be in someone else's shoes. According to Eksta, she had visited the country house during several years, going there regularly for two to three days at a time, idling around, looking at objects, and trying to understand their functions (Balčus 2015). The reason why Eksta would usually spend a couple of days in the abandoned house was that she needed time to alter her mental state. Thus, the artist's project made use of a stranger's private archive to carry out a sensitive study and create an imaginary portrait of a former inhabitant of the house. The current study as a whole, of which this article is only a small part, is intended to contribute – through sociocultural research and extensive inquiries into the man-made environment – to the investigation of local identity and habits, to future-oriented, sustainable development and to the practical, innovation-driven use of local knowledge. Objects and things have a fundamental – not just a functional, but also an emotional – meaning in our private ecosystems. According to the most up-to-date principles of the circular economy, one can suppose that there is nothing that should be "thrown out" and that all things should return to the process of production, consumption, and reuse. The practices of hoarding and collecting objects in Latvia can, on the one hand, be part of the daily routines of different social groups, but, on the other hand, testify to uncontrollable psychological disorders and an obsession with collecting things. The sociocultural and anthropological aspects of saving and collecting warrant further research. It seems that in future research it would likewise be important to ascertain public views about creating a particular environment as well as about what constitutes a tidy (or untidy) living space and what is considered to be a pleasant environment.

Hypothetically, the different creative practices referred to in this article can help us to understand the sociocultural landscape and to foster those social and individual practices that can help us to create a livable and hospitable physical environment. Furthermore, these artistic practices may provide an opportunity to define and evaluate contextual characteristics of the Latvian national identity and of Latvian residents' attitudes towards the appropriation of resources and the use and storage of things. Through their projects, artists participate in preserving local memory. They use different approaches and techniques in the making of their works, including documenting and stocktaking of private object archives, bricolage, and interpretation, as well as purely experiencing other people's possessions. The things collected by humans can be both useless trash and artifacts in their own right, but it is often their authenticity that determines the quality of an artwork that uses them. The deconstruction of things, making use of their parts, and the manipulation of materials to create new products, objects or works of art can stimulate innovation and creativity not only in art but also in science. Practices of embodiment also play an important role in our interaction with the world of things and help us to develop empathy. The added value of an artwork also lies in the role it can play in educating the public about matters of waste management and consumerism, as well as in shaping an understanding of the need for a shift towards a model of circular economy.

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ACCESSIBILITY AND MENTAL HEALTH: THE "ROUTE OF WELLBEING" AT THE LATVIAN NATIONAL MUSEUM OF ART

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ABSTRACT
Due to the global COVID-19 pandemic and governmental orders to self-isolate for epidemiological reasons, the consumption of technologies and digital products for both work and entertainment grew in unprecedented numbers. Many art institutions in Latvia tried to continue their work and reach their audiences through digital education and public programs. In response to the public's increasing mental health awareness and digital fatigue, at the end of 2021, the Latvian National Museum of Art launched a meditative audio guide, "The Route of Wellbeing". The free-of-charge audio guide integrated into a mobile application uses art history and art therapy as a background to create a calm space for the viewer and, simultaneously, to re-contextualize the museum and to suggest how one can experience art differently. Thus, this paper analyses three aspects of "The Route of Wellbeing". Firstly, whether and how does the museum's audio guide raise its users' awareness of mental well-being and mental health? Secondly, to whom and how is it accessible? Finally, how can technological accessibility, or lack of it, create inclusion or exclusion in society?
Keywords: *accessibility, audio guide, disability studies, mental health, museum*

In recent years, rapid technological development has influenced everyday life and contemporary art, providing new forms for creating, distributing, and experiencing it. In the spring of 2020, with the spread of Covid-19 turning into a global pandemic, virtual and online formats took on unprecedented relevance. To maintain contact with the audience, many art institutions in Latvia also tried to continue their work using different digital educational and public programs as well as creating online exhibition experiences. However, the overuse of the online environment for work and pleasure increased digital fatigue in society. In response to the public's increasing mental health awareness and digital fatigue, at the end of 2021, the Latvian National Museum of Art launched a meditative audio guide, "The Route of Wellbeing". The digital audio guide offers the visitors an opportunity to experience the museum as a calm environment and, through different mindfulness practices, encourages them to look at the artworks from different perspectives. This paper proposes to analyze three aspects of "The Route of Wellbeing". Firstly, does the museum's audio guide raise its users' awareness of mental health, and if so, what tools are used to achieve this goal? Secondly, to whom and how is it accessible? Finally, how can technological accessibility, or lack of it, create inclusion or exclusion in our society?

At the beginning of the global COVID-19 pandemic, everyone was encouraged to self-isolate for epidemiological reasons. However, studies have shown that social isolation has created a wide range of psychosocial consequences at the individual and collective levels. Based on experiences reported in previous humanitarian crises, individuals in social isolation, with restricted mobility and little contact with other individuals, are prone to develop a number of mental health problems, such as post-traumatic stress disorder, depression, generalized anxiety disorder, panic attacks, phobias, and substance abuse (Ramirez-Ortiz *et al*. 2020). The Population Survey on Income and Living Conditions 2021 by the Central Statistical Bureau (CSB) of Latvia shows that half (50.2 %) of the Latvian population aged 16 and over believes that the COVID-19 crisis had a negative impact on their mental health. Mental health remains a pervasive social issue affecting millions of individuals' well-being globally. Despite the overall prevalence of mental illness, increasing numbers of individuals needing mental health treatment do not receive it. The researcher and author Deirdre Heenan has pointed out that myths and stereotypes about mental problems have led to the disempowerment and stigmatization of those who experience mental distress (Heenan 2006, 181). The label "mental illness" is stigmatizing and misleading as it encourages individuals to think of "the mentally ill" as a separate category from "normal people". Similarly to the concept of disability, "mental illness" is understood as an individual medical problem rather than one that has environmental and social causes. Thus, the introduction of a meditative audio guide "The Route of Wellbeing" by the Latvian National Museum of Art could be understood as a form of social activism, raising public awareness of mental health as a social issue and offering a short-term solution for the museum visitors.

Based on the information found on the Latvian National Museum of Art webpage, the meditative audio guide "The Route of Wellbeing" is available free of charge in the Latvian National Museum of Art mobile application in Latvian, Russian, and English. The description of the project on the Museum website states, "Audio stories guide the visitor through 12 exposition points of the permanent exposition, exploring such themes as friendship, courage, everyday life, loss, and the unknown. Each stop is accompanied by a thematic narration prepared by art scientist, as well as tasks designed by an art therapist for self-exploration in the interaction with the museum and the artworks" (Meditative Audio Guide: "The Route of Wellbeing" 2021). As the project description suggests, the audio guide is created for the user to explore "mindfulness" in the museum, enabling the individual visitor to observe artworks in the context of the themes discussed in the audio guide at one's own pace, focusing on personal experience. However, neither the museum press release nor the project description explains why it is essential to have this kind of project and what its possible outcomes may be.

Firstly, it is of paramount importance to understand what "mindfulness" means, as the description of the audio guide suggests that it is its core concept, encouraging the visitor to "experience an alternative adventure of the senses, promoting mindfulness and mental well-being" (Meditative Audio Guide: "The Route of Wellbeing" 2021). The concept of mindfulness, introduced to the Western world by Jon Kabat-Zinn, originated from Buddhist philosophy and practice. It can be briefly defined as a non-judgmental process, accepting the present experience as it unfolds moment by moment (Kabat-Zinn 1990). Today mindfulness and the practices that facilitate it have become popular topics in psychotherapy and mental health as well as in self-help and popular psychology literature. In their article "Mindfulness in Therapy: A Critical Analysis", Simona Stefan and Daniel David have pointed out that today mindfulness has become a billion-dollar industry that can potentially harm the individuals practicing it (Stefan et al. 2020, 169). That said, if the concept of "mindfulness" is used for an audio guide in a museum, it should have been explained that it is for the purpose of entertainment, and not as a tool for improving mental wellbeing.

Researchers Daniel David and Steven Jay Lynn have pointed out that the main issue with the mindfulness concept is its emphasis on active detachment; however, the primary objective of psychological interventions is not to diminish emotional responses by employing detachment but to transform dysfunctional negative emotions into functional ones by changing the underlying irrational/distorted beliefs into rational beliefs (David, Lynn, & Ellis 2010; David, Lynn, & Das, 2013). Thus, when the description of "The Route of Wellbeing" and other publications about it mention mindfulness as its core concept, they should also explain what is meant by mindfulness, how this concept is supposed to be used and to what extent. If such an explanation is not given, the audio guide does not raise awareness about the complexity of mental health but instead creates a space for detachment from reality, which can lead to more misunderstanding about mental health problems and the need to visit specialists to receive needed help. Thus, mindfulness practices should have been introduced more cautiously, and the museum should have provided additional information on the purpose of the project and on the need for mental health awareness in our society. It could also have explained more clearly the rationale for the promotion of mindfulness during the museum visit.

One of the critical issues concerning mental health is that, similar to a disability, it is often understood as a homogenous whole defined by a specific medical terminology. For example, a heterogeneous cluster of symptoms experienced by an individual may be labelled "depression". However, the problematic aspect of such definitions is that mental health and mental illnesses are mostly perceived from the medical model perspective, focusing on individuals' need to resolve mental problems or cure mental illnesses. Mental health should be analyzed from a social model perspective, taking into consideration the environment, social barriers, and other aspects of an individual's life that influence their mental well-being. Also, mental health issues are not homogenous. Thus, it is impossible to put everything under one umbrella term. Therefore, setting up a digital app with an audio guide, even if it is done with praiseworthy intentions to raise public awareness of mental health, should be presented as an alternative exhibition viewing experience rather than a tool for meditation and mindfulness. Besides the practice of mindfulness promoted by the audio guide, the description of "The Route of Wellbeing" does not refer to any questions concerning raising public awareness of mental health. Moreover, it utterly fails to explain how we can overcome the barriers of stigma attached to mental health issues through art practices. We can conclude, therefore, that "The Route of Wellbeing" is not a form of institutional activism but a kind of entertainment for a museum visitor as it fails to take a critical approach to mental health issues at the time of the pandemic, which it purports to alleviate.

The second indispensable question concerning the project "The Route of Wellbeing" is the accessibility of the audio guide. In her book *The Question of Access*, the Canadian gender and disability studies scholar Tanya Titchkosky writes, "anything said about access can be read for how it reflects a host of questions: Who has access? Access to where? Access to what? When?" (Titchkosky 2011, 13). These questions are of paramount importance and they need to be asked not only about physical space, such as exhibition space, but also about the digital environment and digital content products. To experience "The Route of Wellbeing," the viewer needs to have a compatible technological device to use the app, i.e. a device that can access the internet anywhere, with a touchscreen and an audio output device. The visitor must download and install the museum's digital application to use it. Only afterwards can the experience begin. Museums are already inaccessible to many potential visitors due to a variety of reasons, such as cost, lack of childcare, institutional language, opening hours not syncing with working hours, or because the artwork does not represent, or address, a person's lived experiences determined by a variety of identity markers, including class,

gender, race, ethnicity, sexuality, disability, and nationality (Fazeli 2019, 23). Furthermore, to access the application in question, the viewer needs to possess the necessary digital skills. The researcher and writer Elizabeth Ellcessor points out that in contemporary society, a useful life is increasingly constructed as a technologically competent life; therefore, those who do not master new technologies are effectively disabled in ways that would have been inconceivable thirty years ago (Ellcessor 2018). For example, many older adults do not have smartphones or do not use all smartphone functions. Does it mean that older adults are not meant to be mindful and experience "The Route of Wellbeing" audio guide? It is improbable that this is the case for the museum because the museum states that "Important strategic values in the museum's work are openness and accessibility for the broadest public, thus raising the quality of life for the society around it" (*About the Latvian National Museum of Art* 2023). However, the project developers might not have thought about the specific characteristics and needs of every kind of individual in society who might be interested in benefiting from this project or about making it easily accessible.

Suppose the visitor already has a device to download the free-of-charge software program that can be used anytime and anywhere. To create digital accessibility, the app must be developed using the Web Content Accessibility Guidelines produced by the World Wide Web Consortium (W3C). Elizabeth Ellcessor has pointed out that if digital content has not been made accessible, one might say that technology fails to "fix" disability and instead creates it, as technological barriers function to exclude certain individuals from full participation (Ellcessor 2018, 3). A lack of proper HTML attributes can render web forms impossible to use by people who rely upon screen readers, input devices other than a point-and-click mouse, or other assistive technologies; thus, users with vision impairments are prevented from accessing the content. Also, in coding and designing the user's interface, one must consider including a number of important functions, such as magnification or zoom option, proper contrast for the text, and making the content readable by screen-reader programs. If none of these functions has been provided, then accessibility has not been a priority in this context. Even though "The Route of Wellbeing" audio files are in textual form, making the content of the audio guide accessible to people with hearing impairments, the museum app and "The Route of Wellbeing" do not have the most straightforward interface design. Thus, the exhibition viewer or the app user still needs diverse skills to use it.

Finally, technological accessibility, or lack of it, creates inclusion or exclusion in society. At this point, the most crucial question is, "Who has access?" The answers will also throw light on how accessibility has been approached while realizing an idea. Creators might think the app, event, or project is designed to include everyone. However, if we do not think of the specific needs of our audience, we participate in the process of exclusion and discrimination. Tanya Titchkosky points out that another form of the disability-as-problem frame is the erasure of disability through the privileging of personhood – a framing of disabled people as 'like everyone else' but only like and not as everyone else since, within this frame, personhood is not located in disability but against it (Titchkosky 2017). This suggests that disabled people can 'resemble' non-disabled others even though they are other to non-disability regardless of the fidelity of the resemblance. As Patricia Berube has pointed out, through the idealization of a corporeal 'normality' and the predominance of mainstream art narratives, museums inevitably contribute to the propagation of stereotypes, making it more challenging for a 'disability culture' not only to emerge but also to be accepted (Berube 2018). Access must be what the disability scholar Jay Dolmage refers to as a "way to move" in the world (Dolmage 2017). That said, accessibility should be an unconditional norm.

Accessibility is a social and economic as well as a physical issue. People's needs are often interconnected and overlapping, and a change that gives greater access to one person,

in turn, benefits another. In creating digital content, which is supposed to be for everyone, it is even more necessary to consider users who do not fit the homogeneous idea of embodiment. As Elizabeth Ellcessor has pointed out, the exclusion of people with disabilities from online media and attendant participatory cultures is particularly troubling, given the potential of these spaces to foster engaged, active citizens of the world. The question is why it is not common practice to create an accessible digital environment. There would be many more benefits, from higher audience engagements to inclusion and participation in art processes.

Disability studies scholars have pointed out that museums were unsuccessful in presenting collections that would be consistent with the values of the marginal identities because public collections were assembled and delivered by academics and curatorial elites who were more familiar with models specific to their disciplines (Witcomb 2003; Berube 2021). We live in the 21st century, and we must change how we create and present art to overcome barriers to access and inclusion. When curators and content creators use the value systems of the upper-middle-class European elite rather than those of the lower social classes, they create dissonance between access and equity in representation and the actual museum practices. When artists, curators, and academics talk about accessibility, they also need to consider the future of art and, ultimately, the audience to whom it will be accessible. Similarly to Tanya Titchkosky, we need to ask ourselves about the kind of audience we create art and other cultural products for. When answering this question, it is necessary to consider the diversity of bodies and minds in society. Rapid technological developments and digital environments allow artists to present their art to their audiences more quickly and make it accessible to people who, for different reasons, cannot participate in the events organized by artists and art institutions. This is also the time to create an alternative economy of hope and communities in which acknowledgement of the diversity of minds and bodies, and thus, accessibility for all, are taken for granted.

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EMOTIONAL EXPERIENCE AND COGNIVE APPRAISAL OF A VISUAL ARTWORK

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ABSTRACT
The current study draws upon the theory of affect as an essential theoretical framework and tool for the interpretation of an artwork. Psychology and neuroscience study affect and emotional processes experimentally, producing measurable data. Empirical observation and a descriptive approach to aesthetic experience are not enough when it is assumed that a work of art has affective dynamics and evokes bodily responses. The author of this paper in cooperation with the Laboratory for Perceptual and Cognitive Systems at the Faculty of Computing of the University of Latvia, has conducted an interdisciplinary study with the purpose to experimentally determine the dynamics of affect arousal - valence and intensity – in the subject while observing artworks that depict human bodies and / or have been stimulated by different bodily experiences. The research question of the study was: what types of body images can potentially create more pronounced affective reactions in the viewer and what is the viewer's aesthetic evaluation of these images? Measurements of affective processes can vary from self-assessment tables to measurements of changes in the physiological responses of the body, for example, fixation of micromovements of the pupils. An original research design was developed as part of the study, including stimulus generation, data collection, and data analysis. The results of the experiment have made it possible to conclude that the methodology of perception experiments can become a research tool for art theory.
Keywords: *aesthetic emotions, body, affectivity, experimental aesthetics*

INTRODUCTION

A work of art can exist as a material object or as a performance without being experienced by a viewer. However, a work of art needs a viewer to reveal its meaning. The viewer's experience of an artwork allows its inner truth to manifest itself. There are a number of metaphors in the Latvian language that describe the strong aesthetic experience caused by a work of art – "this work of art literally pulls out the heart", "my knees go numb in front of the greatness of this art" – or emphasize the quasi-divine quality of artistic creation: the artist has created "dizzying beauty" or "blood-curdling scenes". Such utterances actually describe the physiological impulses generated by the brain, so they are objective, and can be neither ignored nor avoided.

Perceiving and evaluating a work of art is a comprehensive and complex process determined by the nature of a human being as a biological and social being. Visual art is most often perceived with the help of sight, so the focus of the current paper is on the role of visuality in the perception of an artwork. It should be noted that contemporary artists very often work in several media, so the boundaries between artistic genres are not stable. Mixed media are the language of contemporary art. Vision is only one of the five senses with the help of which a person experiences and interprets the world around them, including the work of art. Along with sight, hearing, smell, taste and touch, the sense of balance is also highlighted in modern neurobiology as an important sensor of the material environment surrounding us. Ancient Greek architecture and sculpture demonstrate Greek architects and sculptors' understanding of the importance of balance in the execution of a harmonious structure or of a human figure.

The study of the mutual correlation between sensory perception and emotional experience of an artwork brings the fields of art psychology and aesthetics closer to each other. Works of art are present in the public space, addressing the viewer intellectually, emotionally and often evoking extreme emotional reactions: delight, admiration, or outright indignation, sometimes even the desire to demolish them. How to measure the effect of a work of art on us? What kind of emotional imprint does it make on us, or fails to make? An artwork has the ability not only to influence a person as a social being, but also to affect the viewer emotionally, causing bodily reactions, which are basically a response to an external stimulus. Therefore, it is important not to limit ourselves to empirical observation, but to try to measure the affect caused by an aesthetic experience or the motivation of such an affect. Within the framework of the article, I will present the research that I carried out in the spring/summer of 2022 in cooperation with the researchers of the Laboratory for Perceptual and Cognitive Systems at the Faculty of Computing of the University of Latvia. The research focused on the perception of an artwork and attempted to ascertain whether one of the experimental aesthetic field methods – survey, using self-assessment tables – can be useful in the field of art theory, museum pedagogy, and curatorial practice.

In Latvia, the application of the methodology of perception experiments in the study of a work of art, including audiovisual artworks, is rare. In the recent past, we can mention only a few examples where an audiovisual work of art has been used as a stimulus for interdisciplinary research in psychology and the arts. For example, in 2021, the Laboratory of Perception and Cognitive Research of the Computer Science Faculty of the University of Latvia, in cooperation with J. Vitols Academy of Music, organized an international symposium "Syntax and Semantics of Music and Dance: Formal and Experimental Research", and in 2018, the *Baltic Psychology Journal* published a study "Affective Responses to Staged and Documentary Video Productions" (Vanags, Skudra 2018).

The goal of the research that I carried out in cooperation with the Laboratory of Perception and Cognitive Research was, first of all, to determine what emotional states are caused by viewing a work of art and what the intensity of these states is. Moreover, it aimed to find out what types of images are potentially more affective. In other words, the study aimed to experimentally determine what the dynamics of affect arousal – valence and intensity – are by having the subject of the experiment observe works of art that depict different bodily experiences or that have been provoked by different bodily experiences. Secondly, the study aimed to find out if the methodology of perception experiments can become an innovative tool of art theory. The tools of experimental aesthetics have been used in the field of psychology when studying, for example, the quality of visual communication or product design, but there has been less research of this type in the field of art perception. One of the goals of the study was to find out which of the aspects of the form and content of the 28 artworks chosen for the study could be considered more effective in provoking the kind of emotional response that is deemed appropriate for an artwork in a particular genre.

Norādiet, cik intensīvas ir Jūsu izjūtas, apskatot attēlu?

	Pavisam neizjutu				Ļoti izjutu
Šis attēls man izraisa nostalģiju	2				
Šis attēls mani satrauc			4		
Šis attēls mani pārsteidz					5
Šis attēls mani sadusmo	1				
Šis attēls mani uzjautrina	2				
Šis attēls man patīk					5

Kāds, Jūsuprāt, ir šis attēls? (iespējami vairāki atbilžu varianti)

☐ Skumjš	☑ Intelektuāli izaicinošs	☑ Skaists
☐ Enerģisks	☐ Aizkustinošs	☐ Gartaicīgs
☑ Fascinējošs	☑ Interesants	☐ Vitāls
☐ Mulsinošs	☐ Iepriecinošs	☐ Apburošs
☐ Neglīts		

Fig. 1. Overview of one opening of the survey questionnaire. Screenshot.

In the humanities, two approaches to affect have been adopted, stemming from the origin of the concept: affect as an *elementary state* and affect as an *intense force*. In psychology and neuroscience, affect is closely related to the experience of emotions caused by external stimuli and is viewed as an *elementary state*. In the field of psychology, all emotional states are denoted by the umbrella term "affect", but emotions and moods are considered affective states. The conception of affect as an *elementary state* has further developed in two directions: firstly, in the theory of primary affect (Tomkins 1972), where nine primary affects are identified and divided into positive (joy, interest), neutral (surprise) and negative (suffering, fear, anger, shame, disgust, rejection), and secondly, in the theory of basic emotions (Damasio 2003), which studies affects that are caused by prior experiences and emphasizes the overlap between the cognitive and emotional domains. Affect is viewed as an *intense force* in philosophy and in such fields as literature, art history, communication science, and cultural studies (Ott 2017, 11). The main theoreticians of affect as an intense force, Gilles Deleuze (1925–1995) and Felix Guattari (1939–1992), call the collision and interaction of two or more bodies (organic or inorganic) "affection", and use the term to refer to "the mix of affects that produce a modification or transformation in the affected body" (Colman 2010, 11-12). The concept of affect as an *intense force* is applicable in the interpretation of an artwork and in the elaboration of the philosophical concept of an artwork.

From the perspective of psychology and neuroscience, a work of art, regardless of genre, medium, technical performance, and other formal parameters, arouses powerful emotions that form an aesthetic experience. The instruments for measuring aesthetic experience and emotional experience, or affectivity, can vary from self-assessment tables to measuring changes in the physiological processes of the body, for example, by recording the micromovements of the pupils. The choice of the method depends on the research question and tasks, as well as on the theoretical paradigm, chosen for the research, including a particular conception of aesthetics and aesthetic experience. This study is based on the assumption that there is little difference between emotions and aesthetic emotions.

The research explored in this paper relied on the survey method, using self-assessment tables as a measurement tool. The Aesthetic Emotions Scale (Aesthemos), (Schindler *et al*. 2017) was used to create the questionnaire to test aesthetic emotions in the experience of a wide range of art forms, including literature, music, fine arts, cinema, advertising, and design. Since the work of art functions as an instigator, or stimulus, for emotions in the given experiment, the emotions on the measurement scales are called aesthetic emotions. It should be noted that the boundary between aesthetic emotions and other kinds of emotions is difficult to draw in our lived experience; however, the distinction exists. Having debated the issue at length, the authors of the method used in the research have concluded that only those emotions which the subject experiencing the artwork actually feels, not those which are represented or otherwise expressed in the work of art, are called aesthetic emotions. These are the aesthetically evaluative emotions that form the basis of the aesthetic judgment. Aesthetic emotions are responses to visual, auditory, and cognitive stimuli, and what is important is the aesthetic qualities of the stimulus, that is the properties of an artwork or its reproduction, not the means by which it is achieved, nor the media used to create a given artwork. Although the sensory realms of touch, taste, and smell also evoke certain emotions, such as pleasure or disgust, they cannot be defined as aesthetic emotions. If the stimulus is a work of art, cognitive evaluation of it follows, but if the stimulus is, for example, beauty in nature, no such evaluation may follow (Schindler *et al*. 2017). This approach, therefore, highlights precisely vision as the most important sensory channel for the perception of the artwork, without addressing other types of sensory perception. This research is an attempt to look at an artwork as an emotional stimulus and to evaluate it from the perspective of the psychology of perception, thus expanding the methodology of art theory.

RESEARCH PROGRESS

The study was conducted in four stages. First, the study design was developed, which entailed adaptation of the Aesthetic Emotions Scale and selection of stimuli. The next stage was data collection followed by data analysis and interpretation. The original version of *the scale of aesthetic emotions* is presented in English. For the purposes of survey, it was translated into Latvian. The scale consists of twenty-one categories of emotions, where each emotion label corresponds to a certain value coefficient. Each emotion is described by two utterances or statements. First, an emotion is named and then a description is given of how a specific emotional imprint is manifested. For example, the emotion *"surprise"* is followed by the statement *"baffled me, surprised me"*, or the emotion "*sadness*" is accompanied by the statement "*made me sad / made me feel melancholic*". It should be noted that language is an extremely important tool in this type of research, where the nuance of a word can have a very decisive meaning for the description of an emotion. An artwork as a stimulus to emotion can be measured by valence and intensity. While valence (conditionally) answers

the question “what has been felt?” (positive/negative, pleasant/unpleasant), the intensity scale answers the question “to what extent?”

Nineteen categories of emotions with higher reliability scores were selected from the original scale and used in this study. Six of them were tested for intensity. For example, the statements “I like this picture”, “this picture makes me feel nostalgic”, “this picture makes me angry”, “this picture worries me”, or “this picture amuses me” were followed by a rating from “1” to “5”, where “1” means “not felt at all” and “5” means “very much felt”. The other thirteen emotions were rated by valence and expressed the subject’s reaction to the artwork’s image. For example, the respondent was asked the question “what do you think about this picture?” (multiple answers are possible). An enumeration of qualities followed: beautiful, fascinating, delightful, touching, gratifying, vital, energetic, interesting, intellectually challenging, ugly, boring, confusing, sad. [Fig.1.]

As the researchers were aware that the selection of images significantly determined the character and direction of the research, artworks were purposefully selected from an endlessly wide range of possible visual impulses in which the human body is represented with varying degrees of stylization. The images of artworks used in the experiment are called stimuli. They were mostly reproductions of paintings, photos of sculptures, photos, posters, photo documentation of installations and performances. 28 visual stimuli, or images of works of art, were selected for the research. In the process of data collection and analysis, each image was assigned a code. [Fig. 2.]

Att. Kods	nosaukums
#1	Kristaps Zariņš, „Nur Mahal“, 2017. a/e, 150 x 150 cm
#2	Kristians Brekte „Dzimis, lai zaudētu“, 2012, a/e
#3	Vladislavs Lakše, sienas gleznojums Valmierā, Jāņa Daliņa stadionā, 2019.
#4	Kaspars Perskis „Maska“, 2017, a/e, 55 x 60 cm
#7	Maija Kurševa, „Seriāls“, 2013. jaukta tehnika
#8	Ilmārs Blumbergs, „Seja ar sitienu pa labo pusi”, 2010.
#9	Ilmārs Blumbergs, No cikla “Lūgšana par redzēšanu”, 2004. jaukta tehnika
#11	Ilmārs Blumbergs, “Es pats stroncija starojumā“, 2010 – 2012.
#13	Skuja&Braden, figūra no Venēcijas bienāles kolekcijas, 2022.
#14	Veronika Frolova „Svešķermenis“, 2019, a/ogle, 180 x 120 cm
#19	Ilmārs Blumbergs „Mana galva stroncija starojumā II“, 2011. - 2012. a/e, 160 x 120 cm
#20	Frānisis Bēkons, "Henrietas Moraes portreta studija", 1964, a/e
#23	Ilmārs Blumbergs, kadrs no videofilmas „Cilvēks“, 2004.
#25	M.Gleihs “Rekordus - Dzimtenei!”,1959. Latvijas Valsts izdevniecība, 1959.
#26	P.Asejevs „ Spēlēsim basketbolu – kļusim veikli, spēcīgi un veselīgi!“, 1954.Latvijas Valsts izdevn.
#31	Evelīna Deičmane „Melnās pasakas“, 2007. fotgrāfija
#32	Kristaps Epners “Vingrinājumi”, 2016.
#33	Kristaps Epners, “Vingrinājumi”, 2016. video, instalācija
#34	34.Evelīna Deičmane „Melnās pasakas“, 2007, fotogrāfija, 52 x 74 cm
#36	Sabīne Vernere, „sabine-vernere-3“ , 2020, papīrs/tinte
#38	Miļelis Fišers, „Ardievas“, 2008, a/e/, 128 x 158 cm
#39	Samotrākes Nīke, 2. gs. p.m.ē. H 275 cm
#40	Frančeska Kirke „Zaika“, 2007, a/e, 100 x 73 cm
#41	Žaks Luijs Dāvids, "Marata nāve", 1793, a/e/165 x 128 cm
#42	Jana Briķe „Nieze“, 2011, a/e, tampera, guaša, krītiņi, 50 x 50 cm
#43	Kaspars Podnieks, „Neparasta vieta“, 2010. fotogrāfija
#44	Antonello da Messina „Sv. Sebastians“, 1478 – 1479, a/k, 171 x 85,5 cm
#46	Pīters Pauls Rubenss „Helēna Furmē kažokādas apmetnī“, 1638, k/e, 176 x 83

Fig. 2. List of artworks with codes

In order to obtain comparable and representative data, it was necessary to set specific criteria for the selection of the images to be used in the experiment in order to divide all the images into groups based on the set criteria. This would make it possible to test whether the proposed criterion determines the experience of emotions and their intensity. The criteria could have been different, but in this study the main criterion was a different representation of the body and bodily experience. Four categories were selected. Firstly, images that emphasize the materiality of the represented body were selected (skin, texture, body fragment, visceral motif). The following works were included in the category: Veronika Frolova`s “Foreign Body”, 2019; Jana Briķe`s “Itching” 2011; Ilmārs Blumbergs` “My head in strontium radiation II”, 2011 – 2012; Sabīne Vernere`s “sabine-vernere-3”, 2020; Pīters Pauls Rubens` “Hélène Fourmét in a Fur Cloak”, 1638; and Francis Bacon`s “Portrait Study of Henrietta Moraes”, 1964. The second group of images showed a hybrid body (a human body that incorporates a part of some other living thing). The following works were included in the category: Kristians Brekte`s “Born to lose”, 2012; Kaspars Perskis` “Mask”, 2017; Evelīna Deičmane`s “Black tales”, 2007; Skuja&Braden sculpture from the Venice Biennale collection, 2022; Miķelis Fišers` “Goodbye”, 2008; Frančeska Kirke`s “Zaika”, 2007; and the Nike of Samothrace, 2nd century B.C. The artworks in the third category depicted a disciplined body (a person playing sports, a disciplined posture, a monotonous activity). The following works were included in the category: “Serial” by Maija Kursheva, 2013; M. Gleichs` poster “Records – For the Motherland!”, 1959; Kristaps Epners` “Exercises”, 2016; P.Asejevs` poster “Let’s play basketball – let’s become, agile, strong and healthy !” 1954; Vladislavs Lakše`s mural in Valmiera Olympic Centre, 2021; and Kaspars Podnieks` “Unusual place”, 2010. Fourth, a number of images showed a wounded body (bodily injuries). The following works were included in the category: Ilmārs Blumbergs` “Face with a blow to the right”, 2010 – 2012; Ilmārs Blumbergs` “I myself in strontium radiation”, 2010 – 2012; Evelīna Deičmane`s “Black fairy tales”, 2007; Ilmārs Blumbergs` works from the cycle “Prayer for seeing”, 2004; Kristaps Zariņš`s “Nur Mahal”, 2017; Antonello da Messina`s “St. Sebastian”, 1478 – 1479; Jacques Louis David’s “The Death of Marat”, 1793; and a frame from Ilmārs Blumbergs` video film “Man”, 2004.

The images were presented for viewing in a shuffled order, without attribution. The respondents saw only the picture, without any additional information, including no indication of its belonging to any of the four groups. A complete list of images with the titles of the artworks, their authors’ names, and other attributions was displayed at the end of the survey.

To avoid professional judgements and insights, individuals outside the art field were invited to participate in the survey. The questionnaire prepared on the platform “Question Pro” was sent electronically to 110 respondents, of whom 49 completed the questionnaire and submitted it, which was sufficient to obtain representative data. The respondents were aged between 17 and 61 years and 67% of the respondents were women. It should be noted that in the relevant section of the questionnaire, the respondents most often indicated that they are moderately interested in art.

RESULTS

The obtained data were processed by the researchers of the Laboratory of Perception and Cognitive Systems of the Faculty of Computer Science of the University of Latvia. Analysing the obtained data, it can be concluded that the given categories of images - materiality of the body, hybrid body, disciplined body, injured body – failed to elicit statistically significant variations in the subjects’ emotional responses to them. The belonging of an image to one of the categories is not a uniform criterion for evoking similar emotions. This is clearly demonstrated by the respondents’ use of the statement “this picture is beautiful” to refer to images belonging to different categories. [Fig.3.]

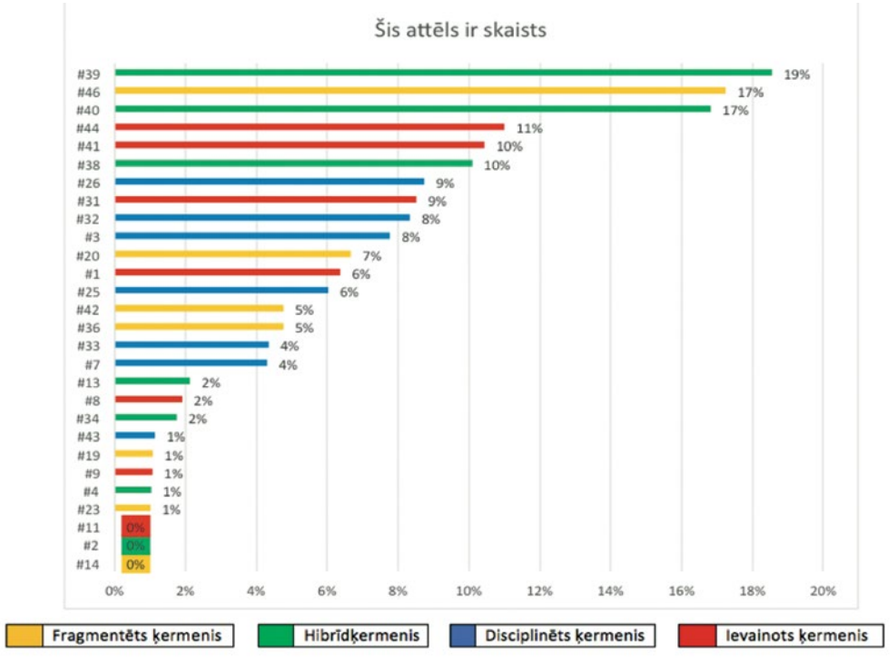

Fig. 3. Summary of the results. Attribute "beautiful" (frequency of selection of the attribute for a given image)

Other emotion measurements also show that images in the same category do not necessarily evoke similar emotions. Thus, it can be concluded that a specifically designed selection of artworks, the creation of a collection, or the content of an exhibition created by a curator can be of secondary importance in relation to the dynamics and valence of the emotions potentially aroused by each individual artwork. This observation is based on the above recognition that aesthetic emotions are those that are actually felt by the recipient, not those that are represented by the artwork. Of course, it cannot be denied that even a set of works of art as a separate unit, united by a certain concept, can have an artistic self-worth, which evokes aesthetic emotions.

The results of the survey show at least one deviation from this statement. For example, the statement "this image is energetic" was applied to images that actually depict physically active bodies. For example, this statement was used to refer to the 1954 sports poster "Let's play basketball - let's become agile, strong and healthy!". Evaluating the images that were most liked, it can be observed that aesthetic enjoyment is directly correlated with the perception of beauty. The images that were rated as beautiful were those of works of art that embodied the compositional principles of balance and unity and that had an overall lighter colour scheme. The image rated as beautiful was often also rated as fascinating (e.g. # 39, the Nike of Samothrace; # 38, Miķelis Fišers' "Goodbye"). Aesthetic pleasure does not exclude such an emotion as sadness, which is sometimes referred to as the *paradox of tragedy*. The aesthetic emotion of sadness was aroused by, for example, picture # 41, Jacques Louis David`s "Death of Marat". On the other hand, dislike was felt towards the images that depicted a deformed figure, impossible postures or actions. (e.g. #14, Veronika Frolova`s "Foreign body", 2019; and # 9, Ilmārs Blumbergs` works from the cycle "Prayer

for seeing"). A picture was considered amusing if it contained a paradox, a humorous narrative, or a bright colour. (e.g. # 36, Sabine Vernere`s "sabine-vernere-3"; # 34, Evelina Deičmane`s "Black Fairy Tales"; # 40, Frančeska Kirke`s "Zaika"). Anxiety was most often caused by the same factors as dislike, which means that the respondents experienced the emotion "anxiety" while looking at an unpleasant picture. For example, the respondents found the following images disturbing: #42, Jana Briķe`s "The Itch"; #14, "Foreign body" by Veronika Frolova; and #9, Ilmārs Blumbergs` works from the cycle "Prayer for seeing". [Fig. 4.]

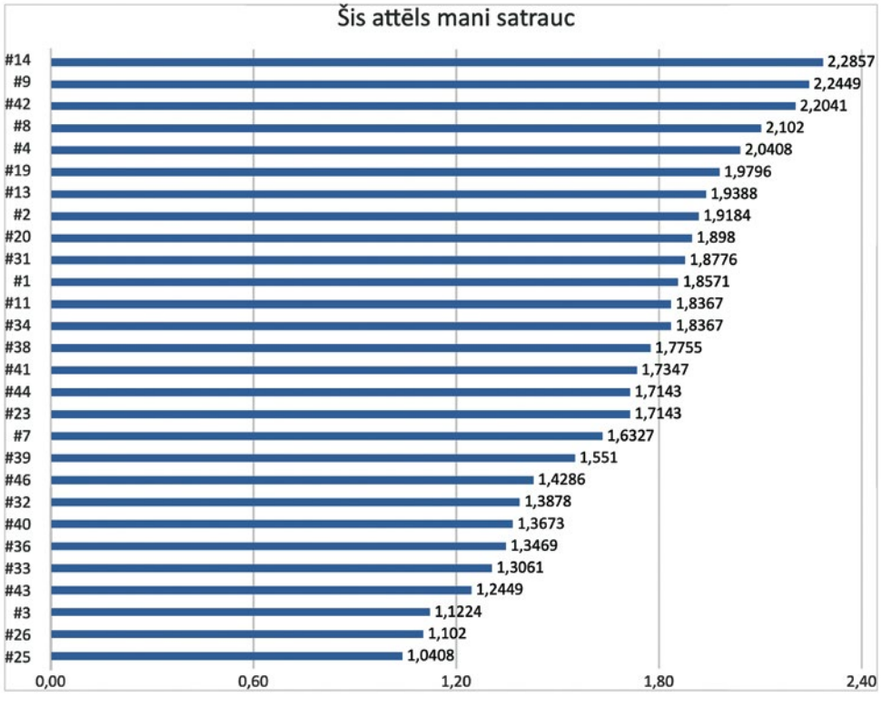

Fig. 4. Summary of the results. "This image makes me anxious" (frequency of choice for the emotion aroused by a given image)

Nostalgia was caused by images that evoked memories in the respondents or represented the kind of past that could have existed. For example, respondents experienced nostalgia while looking at the following posters and photographs: # 25, M. Gleichs` "Records - Dzimtenei!"; # 26, P. Asejevs` "Let's play basketball – let's become agile, strong and healthy!"; # 43, Kaspars Podnieks` "An unusual place ".

A work of art appeals to the viewer both emotionally and intellectually. An emotional appraisal of an artwork usually involves evaluation based on feelings (as opposed to that based on rational conclusions). Works of art that are perceived as original, memorable, successful, meaningful, etc. are usually given rational, rather than emotional, evaluations (Cupchik 2014, 60). The results of this survey show that the respondents considered intellectually challenging pictures interesting (e.g. # 7, Maija Kurševa`s "Serial"; # 31, Evelina Deičmane`s "Black Fairy Tales").

The concept of beauty is more often equated or associated with pleasure, usability,

convenience, or other “comfort categories” in the circle of values propagated by the modern consumer culture. The researcher of culture and post-coloniality, Madina Tlostanova (b. 1970) describes modern aesthetics as one that “has not long since aspired to the beautiful and is, in general, much broader than any classical interpretation of this sphere. During the last hundred years, the terms “beautiful”, “great”, “spiritual” have been pushed out of the scope of aesthetic perception, giving way to such evaluative categories as “new”, “unusual”, “shocking”, “absurd”, “ugly”, “intense”, “indecent”, “evil” and other similar aesthetic categories” (Тлостанова 2020, 89). The results of this study show that images with a negative valence, which can be described as shocking or ugly, did not evoke liking in the respondents and were mostly not rated as “beautiful” or “delightful”. Such images were more likely to confuse, disturb, or infuriate.

CONCLUSIONS

Firstly, the findings of perceptual studies can be useful in art research because they draw greater attention to the viewer’s emotional states while observing artworks. The viewers are always important players in the process of interpreting art, especially when they are encouraged to reflect upon artworks and engage in a dialogue with them. Contemplating a work of art is a complex process that involves not only the viewer`s bodily and sensory perception, but also her emotional self and intellectual abilities. Understanding is always an active process. In order to answer the questions of the questionnaire, the respondents were encouraged to focus on a visual stimulus, that is a representation of an artwork, and reflect upon their experiences by correlating them with the emotions in the questionnaire. Many respondents described identifying the emotion they experienced while contemplating a work of art as a difficult, but rewarding experience. Secondly, along with sociological studies, visitor surveys, etc., the measurement of aesthetic emotions, especially if the measurements are conducted in an institutional environment, can be a useful tool in museum pedagogy, in the development, planning, and analysis of strategies for exhibitions and curatorial practice.

The method described in the current paper has several disadvantages, which could be eliminated by choosing a different tactic in the selection of stimuli and in the way they are presented. Recalling Walter Benjamin’s (1892 – 1940) article on reproducing a work of art (Benjamin 1936), one might ask whether viewing a reproduction of a work of art, rather than the original artwork itself, can create an authentic experience? Although viewing images on the screen of a computer, tablet, or any other smart device is a common phenomenon nowadays, it cannot completely replace the perception of the original, but it cannot be denied that the digital environment can also be a “natural environment” for a work of art. The need to define the criteria for the selection of works of art, as required by this method, is problematic, since each selection is always a subjective interpretation of the importance of artworks by the researcher. Perhaps this problem could be solved by narrowing the selection field as much as possible and focusing on the works of one period, one genre, one style, one theme, or one author. However, even then, the wide range of choices would be a big challenge. The method essentially requires an immediate presentation of an artwork to the viewer, eliciting an instantaneous emotional response. Even a visual, two-dimensional artwork is not the same thing as a reproduced image of this work. The way an image of the original artwork as a visual communicator addresses the viewer is not the same as the way a visual artwork itself addresses and affects the viewer, because visuality is only one aspect of artistic truth.

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MEMORY: A NEUROSCIENTIFIC PERSPECTIVE FOR ARTS AND HUMANITIES SCHOLARS

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ABSTRACT
This article, intended for arts and humanities scholars, as well as artists engaged in artistic research, gives a short overview of memory from the perspective of neuroscience. After a brief outline of the memory system, the article discusses several less intuitive aspects of how memory works. Further, the "unreliability" of memory and the role of memory in learning is discussed. Finally, the memory as linked to the envisioning of the future and to the empathetic understanding of others' viewpoints.
Keywords: *autobiographical memory, imagination, learning, memory loss, neuroscience*

INTRODUCTION

Recently, as I was preparing my paper for the Art Academy conference on the synergy of the humanities and the natural sciences, I shared a part of my paper abstract with my friends. It dealt with prosthetic memory as described by Celia Lury (Lury 1998) and Alison Landsberg (Landsberg 2003), among others: a concept that describes a memory that is perceived as one's own although it has been experienced by somebody else. For example, this approach suggests that photographs can be viewed as memory prostheses. My friend with a background in neuroscience joked: "congratulations on using a phrase that means something entirely different for me". He then shared an article describing a device that can help restore long-term memory in rats with the damaged hippocampal area in the brain (Berger *et al*. 2012). Even though both of us used the same term and considered similar issues, our understanding of what memory is, was vastly different. This anecdotal example points to a wider issue: a gap between neuroscience and many of the natural sciences in general and the approach taken in arts and humanities research. The latter differs from the former not only methodologically, but also terminologically. The gap between the exact sciences and the humanities is, in part, understandable and even necessary due to different epistemologies they employ. However, it creates misunderstandings where none need be, and it often creates an unnecessary barrier between different branches of knowledge production. If these barriers can be overcome, different knowledges about the world could enhance and challenge one another more productively.

The aim of this article is to provide a short overview of the scientific research and recent theories regarding memory, as understood through the lens of neuroscience. The understanding of memory in neuroscience is compared and contrasted with the layperson's understanding of it, and parallels with relevant contemporary theories in the arts and humanities are drawn to mark possible loci of common interest and even shared understanding. Even though the approach taken in this article is tentative, and it is impossible to exhaust the subject in a relatively short paper, hopefully it will serve future researchers in the arts and humanities better if they come across an article dealing with a neuroscientific approach to memory. Even though currently such multidisciplinary research is rarely done, it can provide new insights. An example of such research would be Jill Bennet's article (Bennett 2019) that deals with an experimental technique to help recover recent memories via a portable camera, as well as explains how this experimentation aligns with the understanding of photography versus film. This would be a good example of a common goal reached by researchers from various fields and of the benefits gained in multiple fields of knowledge, while simultaneously improving the well-being of people with memory ailments. However, such research is possible only if all sides can speak a common language; one that this article aims to tentatively delineate.

Memory in neuroscience can be defined as "the capacity of the nervous system to benefit from experience" (Tulving 2000, 727). What is colloquially called memory – the ability to remember specific events of one's past, also called autobiographic episodic memory, – is only a small part of the memory system. In neuroscience, there are three primary ways of researching memory: clinical research on nonhuman primates, clinical research on people with functional deficiencies in the brain (mainly brain lesions that produce certain memory deficits), and non-invasive research on healthy human subjects. However, due to ethical considerations that limit the research options, as well as the complex nature of the subject, our understanding of memory is still incomplete, and new advances are made continuously.

A very basic division of memory is one of procedural versus cognitive memory. Procedural memory is the memory that is expressed in behavior while not being cognitively processed, while cognitive memory is "expressed in thought", that is one is aware of it and it can be consciously processed and contemplated (Tulving 2000, 728). While colloquially "remembering" usually refers to cognitive memory – the memories that can be held in mind – neuroscience recognizes that procedural memory (also "called habit memory, non-declarative memory, and even implicit memory" (Tulving 2000, 728)) is predominant, and present in lifeforms that are not necessarily self-aware, or whose cognitive awareness of their memory processes cannot be fully ascertained since they cannot express their thoughts in speech.

With human subjects, cognitive memory (also called declarative memory, propositional memory, and sometimes explicit memory) has been researched most widely. It is subdivided into working memory that holds information for a short period of time, the perceptional representation system that allows for object identification, semantic memory that mediates the individual's general knowledge about the world, including facts and concepts, and episodic memory that relates to the personally experienced past: the events that happened in an individual's life accompanied by their context and emotions (Tulving 2000, 728; Clark 2018b, 19). Episodic memory is generalized as "memory" in common speech and also in most of the theoretical research in the arts and humanities. However, that does not mean that arts and humanities research is concerned only with episodic memory. Arts and humanities studies that deal with embodiment, including, for example, affect theory, take an in-depth look at the other types of memory, including procedural memory, without naming it as such. Culture studies in general, including feminist studies, gender studies, queer studies, and crip studies, often take an in-depth look at both semantic memory, including categorizations and assumptions, and procedural memory, which refers to the specific way bodies perform in the world. More philosophical approaches often deal with semantic memory as well, questioning deep-seated ontological and epistemological assumptions and often deconstructing their genealogies. It is crucial to keep in mind different understandings of the word "memory" when comparing the neuroscientific approach with the approach taken in the arts and humanities, to avoid misinterpretation of various findings.

To understand the neurological basis of memory, it is necessary to understand that memory is stored and processed in various areas of the brain, which means that loss or impairment of one type of memory does not necessarily mean loss of other types of memory. For example, if the medial temporal lobes of the brain are damaged, only long-term memory is impaired, namely the ability to form new memories and to retrieve some older memories (Clark 2018b, 18). Meanwhile, short-term memory allows us to remember, for example, a question long enough to answer it (even though memories of the entire conversation would probably not be retained), and habitual memory allows us to perform routine actions. Moreover, since the medial temporal lobe is not the storage site for long-term memory, older memories are also retained and can be recalled (Clark 2018a, 6). This means that "losing one's memory" is a complex and unique process. However, such localized damages to the brain are relatively rare and the decline of memory in older people, for example, is usually linked to a more widespread damage to the brain, which is why memory loss seems to gradually impact all types of memory, even if this impairment is sometimes asymmetric. For example, impairment of semantic memory can advance faster than impairment of habitual memory, which is why people can still perform everyday actions even when they cannot name the tools that they are performing them with.

Moreover, the way the memory is stored and retrieved is by no means intuitive; the process by which something is remembered is only partially available to consciousness. For example, brain imaging shows that in a single memory, the information about an object and spatial information are segregated in the medial temporal lobe and then combined in another brain region, the hippocampus (Clark 2018b: 23). This has been proved experimentally. However, we do not perceive this process. We are unaware of memorizing objects and their location in space, as well as spatial relations, separately. On the other hand, two different types of recognition memory – familiarity and recollection – are easy to separate intuitively. Namely, familiarity is a memory of an item that is not linked to the situation in which it was memorized, while recollection involves remembering the item along with the context in which it was encountered. For example, there is a cognizable difference between simply knowing a painting, and remembering not only the painting, but also the exhibition at which it was first seen and the general context of the viewing. However, both types of memory are linked with similar brain regions (hippocampal area and perirhinal cortex), and further research is required to clarify the separation of the functions of both cerebral regions (Clark 2018b: 29-32). The hippocampal region is also suggested to be the place where memories are mapped not only in space, but also in time, as well as within the associational structure (Eichenbaum 2018, 112): it can even be described as "the orchestra leader whose role is to organize the performance of musicians who sit in different places and play in a distinct sequence" (Eichenbaum 2018, 113). To further develop or extend the metaphor of memory as an orchestral performance, we perceive music without being aware of how it is produced. Similarly, our intuitive understanding of how memory operates does not always coincide with the actual processes in the brain. The realization that we don't even realize how our memory works is humbling yet exciting, as it enables us to question common assumptions and to seek new knowledge both scientifically and artistically.

As seen above, memory formation and retrieval are two separate processes. Interestingly, memory storage becomes itself transformed in the course of time as well. While relatively recent autobiographical memories are strongly linked with the hippocampus, more remote autobiographical memories do not depend on the hippocampus (Dede, Smith 2018, 127). The research of autobiographical memories is complicated by the fact that recall of these seems to be impossible without a "suitable semantic cue", which means that autobiographical memories are recalled only when both the episodic memory of the event and the semantic

memory allowing for its recall are present (Dede, Smith 2018, 128). Moreover, the memories of a particular event are not even stored in the same part of the brain, but are distributed throughout the cortex: they are, in fact, the connections between the cortex regions that store the elements of said event (Dede, Smith 2018, 129). Similarly, semantic memory also seems to be stored throughout the cortex. However, in this case memory has a tendency to be more specialized; thus, with a localized damage to the brain a person may not be able to recall colors or may be amnesiac of animate, but not inanimate, objects (Dede, Smith 2018, 143). Thus, even though there are specific regions of the brain that mediate memories, there is no specific region of memory storage, as it is spread throughout the brain, and it can be said that memory is closely interlinked with other faculties of the mind.

Knowing that memories are summoned, or retrieved, from various parts of the brain makes it easier to understand that memory itself is not stable but instead "dynamic and susceptible to modifications when recalled" (Haubrich, Nader 2018, 152). Contrary to one's subjective wish to believe that all one's memories are authentic and to see them as "fixed, non-labile traces" that are passive during retrieval (Haubrich, Nader 2018, 153), they seem to be unreliable in the sense that they are subject to change not only during the process of memorization but also when recalled. Moreover, forgetting is now also understood as an active process. In short, a memory is relatively stable only when it is inactive; after retrieval, it becomes unstable and vulnerable to disruption (Haubrich, Nader 2018, 154). However, this is not always the case, as the destabilization affecting particular memories depends on such parameters as memory strength and age (i.e., older and firmer memories are less likely to be destabilized). Destabilization is less likely to occur when the recall is predictable, when the stimulus is directly linked to the memory in question, or during sleep (Haubrich, Nader 2018, 159). At first glance, the very idea that recalling memories may lead to their alteration or even forgetting sounds terrifying. However, research suggests that this is a necessary and beneficial mechanism: the change of memory is a necessary, even crucial, part of learning (Haubrich, Nader 2018, 160). The ability of our memory to change when we receive new information (Haubrich, Nader 2018, 162) allows us to correct past mistakes, to decouple knowledge from irrelevant contexts, and to modify it in the light of new knowledge. Instead of thinking of memory as "fallible", it would be more precise to think of it as "adaptable".

Therefore, it is perhaps more productive to think about memory as an aspect of learning. Moreover, memory not only holds what we have learned, but also guides us towards new knowledge. According to Lesley K. Fellows, "The relationship between memory and decision-making is circular and iterative: we learn about what we choose to experience, whether directly or vicariously, and our memory representations are adjusted through repeated experience, capturing the central tendency and the variance of outcomes in a given context, to improve subsequent predictions" (Fellows 2018, 233). The experiences and knowledge we have guide us to subsequent experiences and learning, which of course are used to correct and "update" the information we previously had. On the other hand, our lack of knowledge and experience, as well as prior negative experiences in a certain domain, diminish our willingness and ability to seek new inputs from a given field. This avoidance, while understandable, also points to a very human flaw: the tendency to learn more about things that we "want to know about" while neglecting things that we don't know, or that have been unpleasant to learn about. Arguably, this can be seen as an underlying issue in many societal divides, including the division of sciences and humanities; and perhaps a more open-minded attitude towards things that seem hard to understand, or even senseless, could benefit both sides.

Memory is essential not only to learning but also to decision-making and the ability to predict and envision the future. This is borne out by the research done on older adults, which

suggests that their ability to remember past events correlates with their ability to "to integrate information for relationships between items (relational memory)" (Schachter et al. 2007, 658), which in turn allows them to "flexibly recombine details from past events into novel scenarios" (Schachter et al. 2007, 658). This suggests that our memory of the past and of the relations between memorized items also enables us to imagine and prognosticate the future. From this, it can be inferred that memory work is closely linked with the imagination and thinking about the future. Thus, memory is even similar to art creation, where remembered perceptions are reconfigured in imaginative ways to create new artworks, which can help us to understand the past and the present and to envision possible futures.

The constructive episodic simulation hypothesis – the idea that memory plays a role in creating new scenarios – helps us to understand why memory is not a "literal replay of the past" (Schachter *et al*. 2007, 659) but instead a flexible recombination of details of past experiences. Even though the memory thus reconstructed is not perfectly aligned with the actual event in the past, it allows the mind to support the "construction of future events by extracting and recombining stored information into a simulation of a novel event" (Schachter et al. 2007, 659-660). Moreover, the constructive episodic simulation likely includes the work of semantic memory, which provides knowledge about the general properties of events (Schachter et al. 2007, 660). Here, the goal of the cognitive process is not to recall the past perfectly, but to be able to envision new events. The envisioning of new events is linked not only to remembering specific past events but also to more general memories about the causal links between events. Here, we can also think of art that is more concept-driven or even abstract, as this kind of art relies upon semantic memory and engages it in creative interplay with various items to create novel relations among them.

As mentioned above, the organization of the brain "allows one to shift from perceiving the immediate environment to an alternative, imagined perspective that is based largely on memories of the past" (Schachter *et al*. 2007, 660). Here, the faculty of memory can be linked to the ability to imagine different perspectives, including those of others. This ability, called "theory of mind", is an important aspect of empathy. Empathetically understanding alternative viewpoints and perspectives, in turn, creates new memories: not the episodic memories of actual events, but the links between different memories that can be envisioned and strengthened.

Considering memory not only as a mechanical function of memorizing and retrieval, but also as a way of learning, predicting the future, and generating different scenarios from different viewpoints significantly widens the understanding of what memory is and what it does. As neuroscientific discoveries enhance our understanding of memory processes, they also contribute to our philosophical understanding of the human condition and allow for a different view on all human activities, including art creation as a tool that both mimics memory processes and creates new memories, hopefully ones that can allow us to learn more, become more empathetic, and build a personally and globally beneficial future.

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SUSTAINABLE FASHION: DESIGN OPPRTUNITIES AND METHODOLOGY

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ABSTRACT
Every year, around 400 billion m² of textiles are produced in the world's linear economy. About 15% of the fabric used to make clothes ends up as waste during the cutting process. Although there are several initiatives in the fashion industry that point towards a circular economy, there are only a few isolated cases of the application of zero-waste principles in fashion design practice and production. Traditional fashion education methods emphasize the primacy of the satisfaction of the designer's ambitions, and there is a myth in fashion design that it is impossible to create aesthetically pleasing clothing of any silhouette and size while following zero-waste principles. The work process that is based on zero-waste principles is considered too time-consuming and complicated. This article analyzes the teaching tasks of zero waste fashion design - "Square", "Graphic, visual effect", and "Geometric shapes and volumes" – and the challenges and opportunities they present for students in the realization of their ideas. The article also considers the importance of the methods used in accomplishing these tasks for enhancing sustainability in fashion design. The analysis shows the importance of the fashion designer's awareness of the limitations in the experimental fashion design process based on zero-waste principles. The learning-teaching methods of zero-waste fashion design developed in the course of the study are an alternative educational paradigm that provides fashion design students with the knowledge and skills needed for sustainability in fashion design and production.
Keywords: *zero-waste fashion design, sustainability*

INTRODUCTION

During the last two decades, the fashion industry and the research community have become more and more aware of the extent of the environmental problems caused by the fashion industry (Mohajerva Pesaran 2018, 73-80). The linear economy - the production and consumption model "take-make-use-throw" - dates back to the Industrial Revolution and is now considered unsustainable (Andrews 2015, 305–315). The linear economy is still, however, the dominant approach in fashion design. The challenge for the fashion industry is the transition to circular economy practices (Ghisellini et al. 2016, 11–32). Fashion design pedagogy asks students to create an assortment of products based on their unique vision of life or of dressing, in a vertical design process that rarely starts with ecological considerations of raw materials or production sites (Mohajerva Pesaran 2018, 81-87). Addressing the challenge of the circular economy requires attention to the knowledge, skills, and competences needed to create sustainable production and consumption (Hall, Velez-Colby 2018, p 11-24).

Since Fashion designers have contributed to the development of the linear economy, the article examines the methods of the zero-waste fashion production cycle. Some existing theories of consumption practices suggest that appropriation (the use of goods and services for personal and social needs) and appreciation (the symbolic, communicative and aesthetic aspects of consumption) are important apects of sustainability (Warde 2005, 131-153). Young designers have to understand the importance of sustainability; however, the fashion industry is reluctant to engage in sustainable design (Andrews 2015, 305–315). It is argued that changes in design thinking and practice should occur if sustainable development education is fully integrated into design curricula. Material efficiency is one of the principles that can be applied in the design and production cycle. Hence, this article argues for a specific set of fashion design tasks using a common zero-waste methodology, namely the use of the full width of the fabric at the design stage, the planning of patterns, embroidery, prints, and other visual effects, as well as the modeling of silhouettes, volumes, and shapes within the framework of a certain area of fashion design.

In fashion design education, students acquire the theoretical knowledge and practical skills of the design process. They apply their knowledge and skills in choosing styles, shapes, materials, color tones, and pattern elements of a particular fashion item. The silhouette and seamlines that define the fashion design are very important, as are its style and attributes that tell the story of the fashion design collection. Designers play a key role in converting clothes into fashion (Yuniya Kawamura 2005, 57). The paradigm of the new, sustainable approach to fashion design requires a change in attitude and in priorities regarding the fashion design process. This paradigm should change the sequence of operations in the design process so that it stops creating fabric waste. One of the tasks of fashion education is to nurture a sustainable attitude in future designers and to impart to them the kind of knowledge and competences that will help them to build ethical understanding and practical application skills (Salolainen et al.2018, 2-3), as well as to make sustainable fashion design an integral part of their daily work. Students with a fresh perspective and a creative approach are the true messengers of the new era, which is unthinkable without a sensitive attitude towards the environment and its inhabitants. Traditionally, the steps of the clothing design process are: identifying the problem, defining the design idea, making a preliminary drawing of the design, creating a technical drawing of the design, choosing the fabrics, choosing the processing technology, modeling the pattern of the outfit, and developing the design model. Each step can involve a choice in favor of sustainability (McQuillan 2019, 162-192) if the fashion design process is implemented to provide an aesthetic as well as an ethical final product, indicating the critical importance of the designer's understanding, responsibility, and craftsmanship (Rissanen2005, 2-7).

This study uses an evaluative case study approach to demonstrate how zero-waste fashion design assignments fit into the fashion design curriculum and what impact it has on student development. Examining the impact of innovative teaching practices upon selected groups of students suggests that applying a zero-waste approach to curriculum development can promote fashion innovation and stimulate deeper learning. It proposes a method for sustainable development education in fashion design curricula and defines the framework needed to move towards incorporating sustainability into fashion education.

2. METHODOLOGY AND METHODS: SIGNIFICANCE OF LIMITATIONS IN TASKS

The importance of the conditions stipulated in the assignments "Square", "Graphic, visual effect", and "Geometric shapes and volumes" - specific restrictions on the type of garment to be designed and made and on the amount of the fabric students can use to

create the garments - help students to identify the knowledge and skills they still lack and to develop an understanding of the principles of sustainable fashion design. The tasks fashion design students are given can be viewed as mental exercises accomplished thanks to hands-on experiences, which help to develop students' design thinking, including their ability to see the process of making clothes in a broader context. Solving these tasks allows the students to develop the kind of understanding and skills that will be necessary for their future professional work. The use of full width fabric is well known in the history of fashion. It has long been used in the Japanese kimono, Indian sari, ancient Greek chiton and many other historical garments as well as in traditional folk clothing. Timo Rissanen has identified five methods of fashion clothing creation – the traditional "Cut & Sew", "Full Fashioned", and "Jigsaw Puzzle", as well as the sustainable clothing design methods "Cradle to Cradle" and "A-POC" (Rissanen 2005, 2-7). The "Jigsaw Puzzle" method is a version of the "Cut & Sew" sewing method, where the pattern pieces are connected to each other along the length of the fabric like puzzle pieces, so no waste is created and the garment parts fit together in one layout. This cutting and sewing method can be seen in the traditional folk costumes of various nations, as well as in everyday clothes in Europe until the Industrial Revolution (Rissanen, McQuillan 2016, 12-17). The restriction on the type of garment to be designed –shoulderwear or hipswear – helps fashion design students to focus on the silhouette, shape, and dimensions of a certain part of the body. Changing the order of steps in the idea generation process creates stress and confusion and forces us to change the way we think. The steps of the usual clothing design process at the prototyping stage – design sketch, design technical drawing, choice of materials, choice of processing technology, modeling and pattern cutting, development of a design sample – should be planned at the same time. Lateral thinking tools – challenge, focus, concept, and direction (De Bono 2009, 52-77) – are useful here. Creating clothes without trimmings is already a challenge. Because the preliminary pattern blocks can be changed in the proces of making a prototype, it is necessary to anticipate finishing details, fabric direction, pattern placement, and other factors. Students need to understand which of them can be changed and how to change them, while maintaining the focus on the waste-free realization of the idea in the material. The analysis of the survey conducted at the end of the course shows that it is the limitation on the amount of fabric to be used that is the essential catalyst for the change of the conventional ways of thinking about fashion design.

2.1 TASKS

In the process of developing the assignments "Graphic, visual effect", "Geometric shapes and volumes", and "Square", an empirical research method was used. This method is based on the application of the traditional design, cutting, and sewing skills. It also involves practical experiments with modeling the shape of garments and seams to reach zero-waste templates. By studying the importance of, and the potential for, creative thinking in the practical prototyping process, it becomes clear that the various constraints imposed upon the design process by the given task help to expand the traditional approach to rules and techniques in clothing production.

The specified limitation in the "Square" task refers to the limited amount of fabric that can be used in the development of a specific model. The students are given a square as the design work field, where the width of the fabric is equal to the length of the fabric (most often 140 cm X 140 cm). After that, they need to decide upon the type of fabric that will be used and the structure of the design. Finally using the basic pattern pieces, the students create the layout. At the beginning of the first stage of the assignment, defining the exact pattern of the model is a big challenge and also a big risk. Because the traditional sketch-cut-sewing technology will create scraps of fabric, a new creative approach needs to be found. The width of industrially woven fabric depends on the width of the loom and the type of fabric, which can be from 90 cm to 300 cm wide. This is an important factor at the material selection stage, as it will affect the choice of the size and type of the model. According to the traditional approach to prototyping clothes, the amount of fabric needed for basic garments can be ajusted to the height of the human figure, but usually about 1.4 to 1.5 square meters of fabric are needed to produce pants, dresses, jackets, or shirts, so this limited amount of fabric gives the designer a sufficiently wide range of choices in terms of the type of clothing that can be created, using both women's and men's S/M standard measurements. The recommended fabric width for the task "Square" is 1.4 square meters. The restriction that all three assignments specify is the limitation on the type of clothing to be designed, which is shoulder clothing in this particular case. The constraints on model design stipulated by the tasks dictate that the developed model must be wearable. They also determine that the model needs to be ergonomic and allow the body freedom of movement. Moreover, the tasks provide guidelines for the processes of planning and sewing the model in accordance with the concept of the design and its intended functions.

In the task "Graphic, visual effect" (Figure 1), the usable amount of fabric is not limited, but there is a requirement for a planned and integrated visual effect in the layout, which can be achieved using any technique that best suits the author's idea: printed digitally or manually, embroidered, etc.

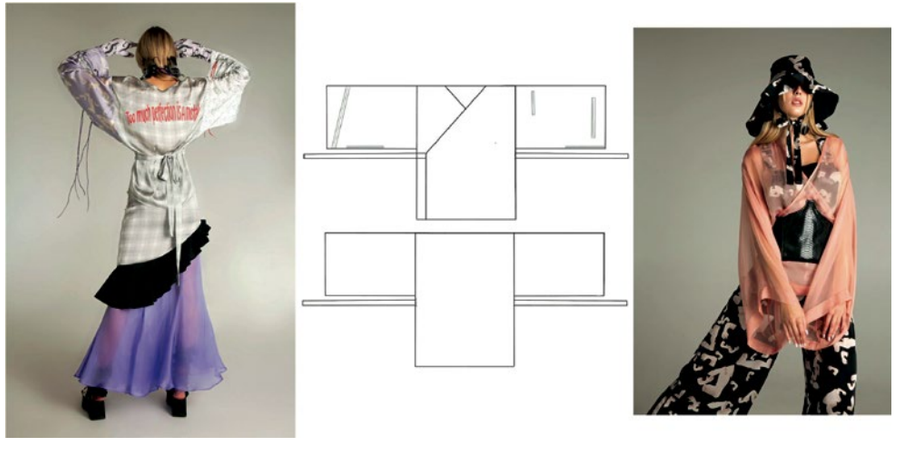

Fig. 1. Author Laura Luīze Valtere, LMA bachelor's program 3rd year 2020

The requirements of the "Geometric shapes and volumes" task, in addition to the limitations introduced by all tasks, concern the shape of the silhouette. The designer is supposed to abstract from the traditionally used basic shapes in order to create a novel set of geometric shapes. The task enables the designer to reach a deeper understanding of the meanings of various shapes and of the relationships between geometric shapes and silhouettes. The design must also comply with ergonomic requirements. Some of the constructive methods that can be used in the design of zero-waste models are: free arrangement of geometric shapes according to the design concept, use of shoulder templates, draping, and combined application of draping and block patterns. Students use those constructive methods that they feel most comfortable with or those that best correspond to the concept of the design.

The biggest changes in the silhouette of the model and the seams are possible at the stage of cutting patterns. Scraps of fabric are produced due to the mutual mismatch of curved line trajectories when using basic templates. In addition, the designer is responsible for the arrangement of all the necessary parts of the model and the compatibility of the parts, as well as their interconnection where necessary. Using leftover pieces of fabric as shape modulation materials, for example, to increase the volume of sleeves, to add pockets, trims, or decorative elements is the easiest way to use fabric leftovers. It is at this stage that the students' greatest lack of experience is revealed, which is confirmed by the results of the survey. At the scale of 1:1 mock-up stage, errors in the design of shapes and silhouettes or ergonomic errors are revealed. To correct these errors, the basic layout needs to be changed again.

3. CASE STUDIES

The zero-waste clothing design course is included in the third year of the BA program and the first year of the MA program in fashion design and it helps students to develop a paradigm of sustainable thinking and practical skills for the application of zero-waste clothing design in their everyday work based on traditional design prototyping knowledge. The course is taken by fashion design students who have produced at least one capsule collection so far and understand the principles of structural modeling and sewing (Figure 2). Within the framework of the task, the stage of idea generation is the biggest challenge,

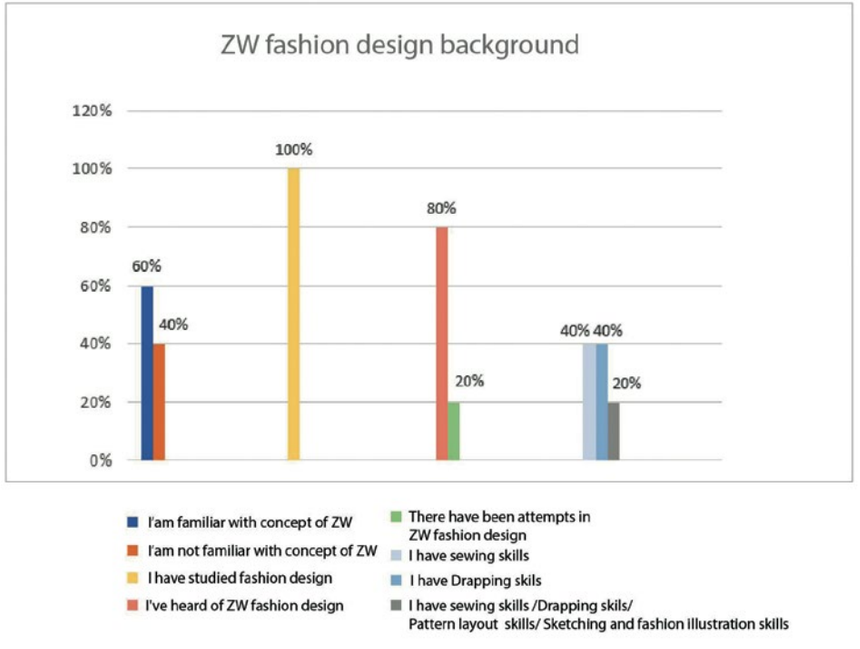

Fig. 2. Survey results at the end of the zero-waste clothing design course in 2020

because when starting their work, the students need to overcome their inertia and to sketch models, forgetting about the imposed limitations. At this stage, students create a mood board in order to define the visual parameters of the design concept and do research with the help

of mock-ups on the scale of 1:4. Although in the survey after the completion of the course, answering the question "Which methods made it difficult to realize the idea?", 40% of the respondents described the small model on the scale of 1:4 as troublesome, the method used in the course acted as a catalyst that motivated the students to take initiative. (Figure 4)

Students are free to choose their personal stylistic expressions in the process of creating models. Some students prefer the draping technique when searching for the most appropriate form and creating the mock -up on the scale of 1:1. In this case, they face the problem of converting the draped model into paper patterns and then re-creating the model precisely in the selected material, which can be explained by their lack of experience and underestimation of the importance of precision. In the design process, students arrange basic patterns according to the design concept. Here it is important to understand the potential consequences of changes so that the product acquires the planned shape, size, and ergonomic properties.

Fig. 3. by Kirke Talu EKA, Department of Fashion Design, Master's Program 1st year, 2021

.The dress created by the student Kirke Talu (Figure 3) is an example of experimental searches for the required form, where scraps of fabric are used to model the shape of the dress and trim the collar. The use of traditional clothing forms, such as the Japanese kimono, helps to arrange pattern pieces much more easily, thanks to a clear and predictable result in terms of the silhouette and shape of the outfit. In the process of carrying out the given task, the students' ability to make changes at each design stage is of great importance. As the survey analysis shows, 50% of the students made adjustments to the clothing silhouette in order to reuse scraps of fabric.

4. CONCLUSIONS

Experiments in the clothes prototyping laboratory show that most of the students in the course have prior knowledge and previous experience of fashion design: they have the knowledge of the clothes design process, the skills to illustrate an idea, to cut patterns for the

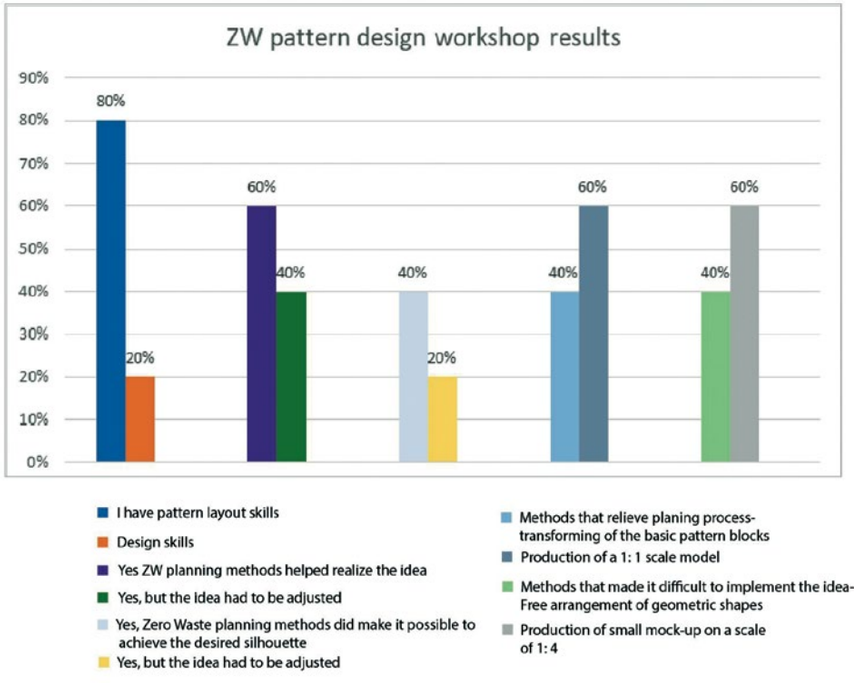

Fig. 4. Survey results at the end of the zero-waste clothing design course in 2020

model and to sew. The student survey conducted after the course shows that the students are not unfamiliar with the ideas of sustainability as such, but most of them lack experience of sustainable practices in their daily work in the fashion design process.

At the end of the course, the outfits created and the answers to the question "Did zero-residue planning methods help to realize the idea?" (Figure 4) show a great variety of styles, which confirms that the teaching-learning methods of designing waste-free clothes do not limit the variety of stylistic possibilities of models developed by future designers. As evidenced by the results of the student survey analysis, in the process of working on their projects, the students came to realize what their weakest skills were and what skills they lacked altogether. The task "Square" was especially helpful in this regard. Students recognized that model construction and layout skills were essential in fashion design. Students with a background in clothes making had a better understanding of the process of creating model layouts, were better able to identify potential opportunities and manipulated the shape, silhouette, and seams of the garment more freely. This points to the need for practical skills in the process of sustainable fashion design. When asked about the mot important qualities fashion designers needed to complete all their tasks successfully, 60% of the students mentioned a creative approach, 40%, flexible thinking, and 20%, accuracy. Thus, creative thinking is of paramount importance for achieving excellent results in fashion design education.

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MEMORY: A NEUROSCIENTIFIC PERSPECTIVE FOR ARTS AND HUMANITIES SCHOLARS

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ABSTRACT
This article, intended for arts and humanities scholars, as well as artists engaged in artistic research, gives a short overview of memory from the perspective of neuroscience. After a brief outline of the memory system, the article discusses several less intuitive aspects of how memory works. Further, the "unreliability" of memory and the role of memory in learning is discussed. Finally, the memory as linked to the envisioning of the future and to the empathetic understanding of others' viewpoints.
Keywords: *autobiographical memory, imagination, learning, memory loss, neuroscience*

Recently, as I was preparing my paper for the Art Academy conference on the synergy of the humanities and the natural sciences, I shared a part of my paper abstract with my friends. It dealt with prosthetic memory as described by Celia Lury (Lury 1998) and Alison Landsberg (Landsberg 2003), among others: a concept that describes a memory that is perceived as one's own although it has been experienced by somebody else. For example, this approach suggests that photographs can be viewed as memory prostheses. My friend with a background in neuroscience joked: "congratulations on using a phrase that means something entirely different for me". He then shared an article describing a device that can help restore long-term memory in rats with the damaged hippocampal area in the brain (Berger *et al*. 2012). Even though both of us used the same term and considered similar issues, our understanding of what memory is, was vastly different. This anecdotal example points to a wider issue: a gap between neuroscience and many of the natural sciences in general and the approach taken in arts and humanities research. The latter differs from the former not only methodologically, but also terminologically. The gap between the exact sciences and the humanities is, in part, understandable and even necessary due to different epistemologies they employ. However, it creates misunderstandings where none need be, and it often creates an unnecessary barrier between different branches of knowledge production. If these barriers can be overcome, different knowledges about the world could enhance and challenge one another more productively.

The aim of this article is to provide a short overview of the scientific research and recent theories regarding memory, as understood through the lens of neuroscience. The understanding of memory in neuroscience is compared and contrasted with the layperson's understanding of it, and parallels with relevant contemporary theories in the arts and humanities are drawn to mark possible loci of common interest and even shared understanding. Even though the approach taken in this article is tentative, and it is impossible to exhaust the subject in a relatively short paper, hopefully it will serve future researchers in the arts and humanities better if they come across an article dealing with a neuroscientific approach to memory. Even though currently such multidisciplinary research is rarely done, it can provide new insights. An example of such research would be Jill Bennet's article (Bennett 2019) that deals with an experimental technique to help recover recent memories via a portable camera, as well as explains how this experimentation aligns with the understanding of photography versus film. This would be a good example of a common goal reached by researchers from various fields and of the benefits gained in multiple fields of knowledge, while simultaneously improving the well-being of people with memory ailments. However, such research is possible only if all sides can speak a common language; one that this article aims to tentatively delineate.

Memory in neuroscience can be defined as "the capacity of the nervous system to benefit from experience" (Tulving 2000, 727). What is colloquially called memory – the ability to remember specific events of one's past, also called autobiographic episodic memory, – is only a small part of the memory system. In neuroscience, there are three primary ways of researching memory: clinical research on nonhuman primates, clinical research on people with functional deficiencies in the brain (mainly brain lesions that produce certain memory deficits), and non-invasive research on healthy human subjects. However, due to ethical considerations that limit the research options, as well as the complex nature of the subject, our understanding of memory is still incomplete, and new advances are made continuously.

A very basic division of memory is one of procedural versus cognitive memory. Procedural memory is the memory that is expressed in behavior while not being cognitively processed, while cognitive memory is "expressed in thought", that is one is aware of it and it can be consciously processed and contemplated (Tulving 2000, 728). While colloquially "remembering" usually refers to cognitive memory – the memories that can be held in mind – neuroscience recognizes that procedural memory (also "called habit memory, non-declarative memory, and even implicit memory" (Tulving 2000, 728)) is predominant, and present in lifeforms that are not necessarily self-aware, or whose cognitive awareness of their memory processes cannot be fully ascertained since they cannot express their thoughts in speech.

With human subjects, cognitive memory (also called declarative memory, propositional memory, and sometimes explicit memory) has been researched most widely. It is subdivided into working memory that holds information for a short period of time, the perceptional representation system that allows for object identification, semantic memory that mediates the individual's general knowledge about the world, including facts and concepts, and episodic memory that relates to the personally experienced past: the events that happened in an individual's life accompanied by their context and emotions (Tulving 2000, 728; Clark 2018b, 19). Episodic memory is generalized as "memory" in common speech and also in most of the theoretical research in the arts and humanities. However, that does not mean that arts and humanities research is concerned only with episodic memory. Arts and humanities studies that deal with embodiment, including, for example, affect theory, take an in-depth look at the other types of memory, including procedural memory, without naming it as such. Culture studies in general, including feminist studies, gender studies, queer studies, and crip studies, often take an in-depth look at both semantic memory, including categorizations and assumptions, and procedural memory, which refers to the specific way bodies perform in the world. More philosophical approaches often deal with semantic memory as well, questioning deep-seated ontological and epistemological assumptions and often deconstructing their genealogies. It is crucial to keep in mind different understandings of the word "memory" when comparing the neuroscientific approach with the approach taken in the arts and humanities, to avoid misinterpretation of various findings.

To understand the neurological basis of memory, it is necessary to understand that memory is stored and processed in various areas of the brain, which means that loss or impairment of one type of memory does not necessarily mean loss of other types of memory. For example, if the medial temporal lobes of the brain are damaged, only long-term memory is impaired, namely the ability to form new memories and to retrieve some older memories (Clark 2018b, 18). Meanwhile, short-term memory allows us to remember, for example, a question long enough to answer it (even though memories of the entire conversation would probably not be retained), and habitual memory allows us to perform routine actions. Moreover, since the medial temporal lobe is not the storage site for long-term memory, older memories are also retained and can be recalled (Clark 2018a, 6). This means that "losing one's memory" is a complex and unique process. However, such localized damages to the brain are relatively rare and the decline of memory in older people, for example, is usually linked to a more widespread damage to the brain, which is why memory loss seems to gradually impact all types of memory, even if this impairment is sometimes asymmetric. For example, impairment of semantic memory can advance faster than impairment of habitual memory, which is why people can still perform everyday actions even when they cannot name the tools that they are performing them with.

Moreover, the way the memory is stored and retrieved is by no means intuitive; the process by which something is remembered is only partially available to consciousness. For example, brain imaging shows that in a single memory, the information about an object and spatial information are segregated in the medial temporal lobe and then combined in another brain region, the hippocampus (Clark 2018b: 23). This has been proved experimentally. However, we do not perceive this process. We are unaware of memorizing objects and their location in space, as well as spatial relations, separately. On the other hand, two different types of recognition memory – familiarity and recollection – are easy to separate intuitively. Namely, familiarity is a memory of an item that is not linked to the situation in which it was memorized, while recollection involves remembering the item along with the context in which it was encountered. For example, there is a cognizable difference between simply knowing a painting, and remembering not only the painting, but also the exhibition at which it was first seen and the general context of the viewing. However, both types of memory are linked with similar brain regions (hippocampal area and perirhinal cortex), and further research is required to clarify the separation of the functions of both cerebral regions (Clark 2018b: 29-32). The hippocampal region is also suggested to be the place where memories are mapped not only in space, but also in time, as well as within the associational structure (Eichenbaum 2018, 112): it can even be described as "the orchestra leader whose role is to organize the performance of musicians who sit in different places and play in a distinct sequence" (Eichenbaum 2018, 113). To further develop or extend the metaphor of memory as an orchestral performance, we perceive music without being aware of how it is produced. Similarly, our intuitive understanding of how memory operates does not always coincide with the actual processes in the brain. The realization that we don't even *realize* how our memory works is humbling yet exciting, as it enables us to question common assumptions and to seek new knowledge both scientifically and artistically.

As seen above, memory formation and retrieval are two separate processes. Interestingly, memory storage becomes itself transformed in the course of time as well. While relatively recent autobiographical memories are strongly linked with the hippocampus, more remote autobiographical memories do not depend on the hippocampus (Dede, Smith 2018, 127). The research of autobiographical memories is complicated by the fact that recall of these seems to be impossible without a "suitable semantic cue", which means that autobiographical memories are recalled only when both the episodic memory of the event *and* the semantic

memory allowing for its recall are present (Dede, Smith 2018, 128). Moreover, the memories of a particular event are not even stored in the same part of the brain, but are distributed throughout the cortex: they are, in fact, the connections between the cortex regions that store the elements of said event (Dede, Smith 2018, 129). Similarly, semantic memory also seems to be stored throughout the cortex. However, in this case memory has a tendency to be more specialized; thus, with a localized damage to the brain a person may not be able to recall colors or may be amnesiac of animate, but not inanimate, objects (Dede, Smith 2018, 143). Thus, even though there are specific regions of the brain that mediate memories, there is no specific region of memory storage, as it is spread throughout the brain, and it can be said that memory is closely interlinked with other faculties of the mind.

Knowing that memories are summoned, or retrieved, from various parts of the brain makes it easier to understand that memory itself is not stable but instead "dynamic and susceptible to modifications when recalled" (Haubrich, Nader 2018, 152). Contrary to one's subjective wish to believe that all one's memories are authentic and to see them as "fixed, non-labile traces" that are passive during retrieval (Haubrich, Nader 2018, 153), they seem to be unreliable in the sense that they are subject to change not only during the process of memorization but also when recalled. Moreover, forgetting is now also understood as an active process. In short, a memory is relatively stable only when it is inactive; after retrieval, it becomes unstable and vulnerable to disruption (Haubrich, Nader 2018, 154). However, this is not always the case, as the destabilization affecting particular memories depends on such parameters as memory strength and age (i.e., older and firmer memories are less likely to be destabilized). Destabilization is less likely to occur when the recall is predictable, when the stimulus is directly linked to the memory in question, or during sleep (Haubrich, Nader 2018, 159). At first glance, the very idea that recalling memories may lead to their alteration or even forgetting sounds terrifying. However, research suggests that this is a necessary and beneficial mechanism: the change of memory is a necessary, even crucial, part of learning (Haubrich, Nader 2018, 160). The ability of our memory to change when we receive new information (Haubrich, Nader 2018, 162) allows us to correct past mistakes, to decouple knowledge from irrelevant contexts, and to modify it in the light of new knowledge. Instead of thinking of memory as "fallible", it would be more precise to think of it as "adaptable".

Therefore, it is perhaps more productive to think about memory as an aspect of learning. Moreover, memory not only holds what we have learned, but also guides us towards new knowledge. According to Lesley K. Fellows, "The relationship between memory and decision-making is circular and iterative: we learn about what we choose to experience, whether directly or vicariously, and our memory representations are adjusted through repeated experience, capturing the central tendency and the variance of outcomes in a given context, to improve subsequent predictions" (Fellows 2018, 233). The experiences and knowledge we have guide us to subsequent experiences and learning, which of course are used to correct and "update" the information we previously had. On the other hand, our lack of knowledge and experience, as well as prior negative experiences in a certain domain, diminish our willingness and ability to seek new inputs from a given field. This avoidance, while understandable, also points to a very human flaw: the tendency to learn more about things that we "want to know about" while neglecting things that we don't know, or that have been unpleasant to learn about. Arguably, this can be seen as an underlying issue in many societal divides, including the division of sciences and humanities; and perhaps a more open-minded attitude towards things that seem hard to understand, or even senseless, could benefit both sides.

Memory is essential not only to learning but also to decision-making and the ability to predict and envision the future. This is borne out by the research done on older adults, which

suggests that their ability to remember past events correlates with their ability to "to integrate information for relationships between items (relational memory)" (Schachter *et al*. 2007, 658), which in turn allows them to "flexibly recombine details from past events into novel scenarios" (Schachter *et al*. 2007, 658). This suggests that our memory of the past and of the relations between memorized items also enables us to imagine and prognosticate the future. From this, it can be inferred that memory work is closely linked with the imagination and thinking about the future. Thus, memory is even similar to art creation, where remembered perceptions are reconfigured in imaginative ways to create new artworks, which can help us to understand the past and the present and to envision possible futures.

The constructive episodic simulation hypothesis – the idea that memory plays a role in creating new scenarios – helps us to understand why memory is not a "literal replay of the past" (Schachter *et al*. 2007, 659) but instead a flexible recombination of details of past experiences. Even though the memory thus reconstructed is not perfectly aligned with the actual event in the past, it allows the mind to support the "construction of future events by extracting and recombining stored information into a simulation of a novel event" (Schachter *et al*. 2007, 659-660). Moreover, the constructive episodic simulation likely includes the work of semantic memory, which provides knowledge about the general properties of events (Schachter *et al*. 2007, 660). Here, the goal of the cognitive process is not to recall the past perfectly, but to be able to envision new events. The envisioning of new events is linked not only to remembering specific past events but also to more general memories about the causal links between events. Here, we can also think of art that is more concept-driven or even abstract, as this kind of art relies upon semantic memory and engages it in creative interplay with various items to create novel relations among them.

As mentioned above, the organization of the brain "allows one to shift from perceiving the immediate environment to an alternative, imagined perspective that is based largely on memories of the past" (Schachter *et al*. 2007, 660). Here, the faculty of memory can be linked to the ability to imagine different perspectives, including those of others. This ability, called "theory of mind", is an important aspect of empathy. Empathetically understanding alternative viewpoints and perspectives, in turn, creates new memories: not the episodic memories of actual events, but the links between different memories that can be envisioned and strengthened.

Considering memory not only as a mechanical function of memorizing and retrieval, but also as a way of learning, predicting the future, and generating different scenarios from different viewpoints significantly widens the understanding of what memory is and what it does. As neuroscientific discoveries enhance our understanding of memory processes, they also contribute to our philosophical understanding of the human condition and allow for a different view on all human activities, including art creation as a tool that both mimics memory processes and creates new memories, hopefully ones that can allow us to learn more, become more empathetic, and build a personally and globally beneficial future.

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TEXTILE MOSAICS: THE CASE OF INTA AMOLIŅA

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ABSTRACT
Until the middle of the 19th century, craftsmen and artists in Europe and other countries had not considered textile mosaics as a professional occupation, associating it with poverty. Today textile mosaics hold a stable place among modern textile art techniques. In the context of the synergy between the natural sciences and the humanities, the current study starts by reviewing the use of the underappreciated technique of sewing textile mosaics as a component of recovery therapy for English soldiers after the Crimean War (1853-1856), the Indian Rebellion (1857-1858), and the Anglo-Boer War (Second Boer War 1899 – 1902). In the middle of the 20th century in Europe, Scandinavia, and the United States of America, textile mosaics became a unique branch of textile art. Textile mosaics are also associated with handicrafts and rehabilitation practices. Until the middle of the 20th century, textile mosaics had not been widespread in Latvia as little was known about them thanks to the Iron Curtain that separated Latvia from the west. Therefore, particularly noteworthy are the first attempts of the textile artist Inta Amoliņa (b. 1952) in 1983 to study the textile mosaic technique in the context of professional textile art.
The purpose of this research is to highlight the most important aspects of textile mosaics and to draw attention to the importance of the textile mosaic technique in the context of the unwritten history of Latvian textile art. The paper draws upon a wide range of museum materials, including those available at the Victoria and Albert Museum and the International Quilt Museum of the University of Nebraska. The study also makes use of the Lausanne Biennale database archive (Foundation Toms Pauli. Tapisseries. Art textile), articles in periodicals and I. Amoliņa's own commentary upon her creative activity and experience in the textile industry.
Keywords: *textile art, art therapy, hierarchy of textile techniques, craft, textile*

INTRODUCTION

Decorative applied art, including textile art, is highly developed in Latvia, and Latvian textile artists apply a wide range of materials and techniques in their work. In the 1980s, the development of textile art in Latvia testified to the courage of Latvian artists to consciously follow the latest art trends in the world despite the inauspicious political situation. Inta Amoliņa was one of the artists in that period who explored the multifaceted basic principles of textile mosaic, including geometric abstraction. This technique was a notable novelty because since the 1960s the dominant technique in the textile art in Latvia had been weaving. In 1983, I. Amoliņa's work "Karogs" ("Flag") was both the first textile mosaic and at that time the largest textile work created on a flat surface in Latvia. It was also the first textile work to be exhibited outside traditional exhibition spaces – on a wall of St Peter's Church in Riga. It was an outstanding example of Latvian textile art. In the following years, the artist's creative activity was motivated by her passion for developing a single but multifaceted textile mosaic technique. In addition, I. Amoliņa drew upon her experience and achievements to develop the lecture course "Textile Techniques" (1997-2018) for the students of the Fashion Department of the Art Academy of Latvia. So far, I. Amoliņa's personality, creative works and lecture courses have not been much studied, which is unfortunate, but it is worth doing, because her course at the Art Academy represents an essential overview of Latvian textile art in the context of the development of world textile art. Her approach to the textile mosaic sewing process includes mathematical thinking and geometric perception.

ORIGINS AND TERMINOLOGY OF TEXTILE MOSAICS

The beginnings of the textile mosaic technique are closely related to a special attitude of craftspeople towards the material (secondary use of material) and to the textile sewing technique. A striking example of sewing textile mosaics can be found in the history of the European migration to America in the 19th century and the early 20th century. The migrants were destitute and lacked basic comforts. The items they took with them were used, repaired, and reused. Among other things, textiles were patched with scraps of worn-out fabrics, giving them a different look as a result (Muze 1999, 4). On the other hand, in Asia, the history of Japanese textiles alongside the development of kimono is unthinkable without the *boro* style[1]. Japanese farmers wove their own fabrics from cotton, linen, and hemp to create practical everyday clothing. For the sake of thrift, their garments were repaired with fabric scraps and worn by several generations. As a result of long-term mending, their clothing became decorative, multi-layered, and warm.

Several studies on textile mosaic indicate that in the 19th century, as a primitive and simple technique of stitching small pieces of fabric together, it was not considered a professional occupation. Generally, due to thriftiness, textile mosaic was used on the farm to make useful and functional items, such as blankets, carpets, tablecloths, clothes for daily wear, etc. For example, in 19th century England, the technique of textile mosaic was practised by women of all social classes, but it was at the bottom of the hierarchy of needlework techniques, well below such techniques as embroidery or knitting. What is more, as the researcher Bridget Long (1950) points out, the term textile mosaic in the 19th century hardly appears in literature or periodicals (Long 2014). Similarly, in the 20th century in Russia after the Second World War, *textile mosaic* was not included in the list of state-supported arts and crafts industries as it was considered a mark of poverty (Муханова 1998). In Latvia in the 19th century, leftover fabric and scraps of fabric were used in the making of woven rag blankets[2], which required the application of different textile techniques. Also worth a separate study are ornamental compositions for the textile appliqué technique, drawn by Jūlijs Madernieks (1870–1955) in the beginning of the 20th century. The appliqué technique is an integral part of the textile mosaic basics. In her article "Ornamental metamorphoses in the graphics of Jūlijs Madernieks", Inta Pujāte (1957) reveals the wide range of applications of ornaments in his works: the ornaments were intended for various types of textiles and textile techniques, such as embroideries and appliqués, floor, wall and bed covers, window and door curtains, tablecloths, furniture fabrics, association flags, and hand-held fans (Pujāte, 2021: 106). Unfortunately, the author of this study has not been lucky enough to

1 "boroboro": something tattered or repaired
2 A blanket, a floor mat, where fabrics cut into strips are woven into linen or bale threads

Fig. 1. Memorial quilt. Author: Nancy Ward Butler (1779-1863). Made in 1842 to commemorate the death of a granddaughter. Dimensions 202 x 205 cm. Source: National Museum of American History.

find photographic evidence of textile samples developed in the appliqué technique based on the sketches by J. Madernieks.

In Latvia, the concept of *textile* mosaic began to be used in the mid-1980s to describe non-traditional techniques used by artists in textile art (Kalniete 1985, 17). In the periodicals of the 1920s and 1930s, advertisements for housekeeping and needlework courses indicated that in addition to weaving, embroidery, knitting, etc., there was also an opportunity to learn the skills of mending and patching clothes, but samples of mended or patched clothes were not shown at the annual exhibitions organized by the courses. The headlines of several Latvian publications show that great attention was paid to the use of fabric scraps during the Second World War: "... the most valuable waste material is wool rags. They are shredded and mixed with a new material, then used to weave the cloth for soldiers' uniforms. Cotton rags are also shredded, but they mostly turn into upholstery stuffing. Coats, suits, dresses, linen, hats, dress shoes, gloves, stockings, collars, suspenders, handkerchiefs, curtains, floor coverings, horse tacks, ends of ropes, dust rags, flags - nothing is too big or too small to travel to the fabric collection sites" ("Audumu vākšanas talkā" 1942, 1). During the war, articles also

appeared about the use of fabric scraps in the making of clothing and household items. In 1940, the publication "Bed covers and pillows made from the remnants of various fabrics" in the magazine "Zeltene", which featured the photos of a blanket and a pillow sewn from small pieces of fabric, was one of the first articles to introduce the textile mosaic technique to the wider public in Latvia. It is important to emphasize that the sewing technique used in the featured textile works is not specified in this article, because at that time a term for it did not exist in Latvian. The term *textile mosaic technique* is based on several interconnected, but different techniques: *patchwork, quilting, and intarsia*.[3] Corresponding terms for these techniques in Latvian do not exist. The term patchwork refers to the technical principle where the connection of geometrically shaped fabrics, or patchwork, is the top layer of the textile work. Quilting, on the other hand, is a technique of stitching through several layers of fabric, resulting in a ribbed relief. The basic principle of creating a mosaic is the *intarsia* technique, which, in the context of textiles, means that the fabric parts are interconnected without seams. Describing Inta Amoliņa's textile work "Karogs" in 1984, the art researcher Pēteris Bankovskis (b. 1952) states that the translation of the term *patchwork* in the English-Latvian dictionary - "1. an object sewn from various rags (scraps); 2. a superficial text, compilation" - is not a very noble explanation and does not express the essence of the textile work in question. Works sewn in the textile mosaic technique are equivalent to tapestries, which were highly valued in the 1980s (Bankovskis 1984: 31). In her master's thesis "Quilt" defended in 1997, I. Amoliņa reveals that many artists are horrified by the word "quilt": the stereotypical association between quilts and bed covers threatens to put a stamp of philistinism on the artist`s work (Amoliņa 1997, 55). Perhaps in 1985, in her article "Art of the Young in Moscow", the art scholar Irēna Bužinska (b. 1955) is the first to apply the term *textile mosaic*, widely used in Europe and America at that time, to the works of I. Amoliņa. From then on, textiles made by other artists, based on different techniques of sewing pieces of fabric together, have also been classified under this term.

TEXTILE MOSAIC AS A HEALING THERAPY

One of the pioneers of art therapy, Maxine Borowsky Junge (1937) emphasizes: "... since prehistoric times, art has played a decisive role in the history, development, culture and consciousness of mankind" (Junge 2015, 7). Dance, drama, visual art, and music have been used not only for aesthetic purposes, but also to heal, to facilitate the expression of emotions, and to preserve and pass on experiences to the new generation. Art therapy uses various visual and plastic art materials, means of expression, techniques, and practices (drawing, graphics, painting, collage and mosaic, modeling from clay and plasticine, sculpting, installation, etc.) to facilitate the expression of thoughts, ideas, experiences, feelings, emotions, needs, problems, etc. (Mārtinsone 2009). We can give several examples of the use of textile mosaic in art therapy in Europe and the United States in the 19th century. In 1851, at the first international exhibition - the Great Exhibition of the Works of Industry of all Nations in London - in the hall "Tapestry, carpets and floor coverings, lace and embroidery", four textile mosaic works made of wool fabric were exhibited. These textiles were considered unusual. Stephen Stokes (1820-1900), the author of the tablecloth exhibited there, was awarded a bronze medal and a certificate. Stokes was a war veteran and policeman in Dublin and had worked on his award-winning tablecloth from 1833 until 1853. There is no information

3 The term intarsia comes from the Italian *intarsio* and refers to a decorative inlaid pattern in a surface, especially a mosaic in wood. It is similar to the French term *marqueterie*, which also refers to a mosaic-like ornament. Known in Europe since the early 15th century, and practised in Prussia and Saxony from the 18th century on, and in Britain from the 1830s to the 1880s.

in the exhibition catalog about Stokes's motivation for working on it for over 20 years, but researchers at the Victoria and Albert Museum point to several sources that suggest that he had started the textile mosaic project as an escape from alcoholism (Rose 2011). It is also indicated in the article of the British workers' magazine "Temperance" that textile mosaics were recommended as a form of healing therapy for soldiers. In this case, making textile mosaic is likened to occupational therapy, which is based on the acquisition of textile handicraft skills. Hand-sewing is a quiet and intimate activity that can be done alone or in a group in order to create a collective textile work. Below are several 19th century examples of sewing textile mosaics for therapeutic purposes in European, American, and Australian museums:

1. A memorial or mourning blanket. In the nineteenth century the expression of mourning was often the basis of a needlework design composition. Possibly, sewing was a way of coping with grief as well as creating a memorial to a loved one. Clothing of the deceased was often included in the needlework to preserve special memories and provide comfort to the grieving (National Museum of American History). In America, such quilts were called *memorial* or *mourning* quilts, and the purpose of making them was to mark an important life event. Nancy Ward Butler (1779 - 1863) made a 202 x 205 cm cotton appliqué quilt (Figure 1) to commemorate the death of her granddaughter, Nancy Adelaide Butler (1841-1842). Her granddaughter died of a scarlet fever, a serious and often fatal childhood disease at the time, in New York in 1842. The inscription on the blanket shows that the girl was only 20 months young (National Museum of American History).

2. Rajah[4] Textile Mosaic Quilt. Seeing the appalling unsanitary conditions of the prisoners in Newgate Prison in Great Britain in 1813, the social reformer Elizabeth Fry (1780-1845) initiated a general reform of the prison, which included the employment of prisoners. Fry believed that sewing textile mosaics was an ideal job for imprisoned women. Suitable because, although technically primitive, it was time-consuming and complex, so meditative practice and contemplation (immersion in oneself) together with touch contributed to the improvement of mind and character. In the 18th and 19th centuries, exile was the second most severe punishment after the death penalty. The remarkable Rajah Textile Mosaic Quilt **(Figure 2)** was made in 1841 by 180 female convicts in 3 months while on a convict ship before deportation. They were brought to Tasmania in 1841. There, the Raja's blanket was presented to Lady Jane Franklin (1791-1875), wife of the Governor of Tasmania, as evidence of women's employment (Hayter, 2002). Currently the blanket is in the National Gallery of Australia and is one of the brightest examples of collective textile work (Murray 2018).

3. Military or "recovery" quilts. For the first time military recovery blankets were mentioned in the periodicals of the Crimean War. The military leadership of the war commissioned the artist Thomas William Wood (1855-1872) to paint a portrait of the wounded private Thomas Walker (1828-1889)[5]. In the painting, Walker can be seen in a clean bed, sewing a textile mosaic quilt in a half-sitting position. The promotion of the soldier as a quilter was part of a deliberate campaign across the UK to rehabilitate the public opinion about the government's carefree management of war, and to promote quilting as a masculine and healthy alternative to, for example, alcoholism and gambling (Gero 2017). There is little additional evidence that convalescing soldiers practiced quilt-making. The

4 Rajah is the name of the ship on which the convict women were transported

5 The painting is in the collection of the Royal College of Surgeons of London at the Hunterian Museum in London

Fig. 2. Rajah Quilt. Author: 180 convicted women. Made in 1841. Dimensions 325 x 337 cm. Source: National Gallery of Australia.

latest studies show that quilts were sewn by ordinary soldiers, looking for a way to spend their time in a more meaningful way, and possibly also sewn by prisoners of war or army tailors. The quilts were basically sewn from parts of military uniforms of wounded or dead soldiers (Hollander 2017). Less than a hundred quilts sewn in hospitals and POW camps in the time of the Crimean War (1853-1856), the Indian Rebellion (1857-1858), and the Anglo-Boer War (1899-1902) have survived to this day. In the 19th century, apart from serving rehabilitation purposes or demonstrating and promoting sewing skills, army textile mosaic quilts also became a source of additional income when men's quilts were displayed at public fairs and exhibitions (Figure 3).

In the United States, the sewing of army quilts continues to this day. Textile mosaic quilts are sewn by both war veterans and soldiers as a part of general rehabilitation. Wounded soldiers receive a blanket as a gift and comfort during their recovery. Quilts are also presented to US Army veterans as an award at the Golden Plains Quilts of Valor ceremony. By 2020, 700 war veterans had been granted such a blanket (Coakley 2021). The idea behind

the awarding of a quilt is to thank you for your service in the army. On the other hand, in the 20th century textile mosaic quilts sewn for rehabilitation purposes in Western Europe did not revive or promote the idea that they could become a source of inspiration for artistic handicrafts. Perhaps sewing blankets was associated with imitation rather than originality (Amoliņa 1999, 28).

TEXTILE MOSAIC AS AN INDEPENDENT BRANCH OF TEXTILE ART IN EUROPE AND LATVIA

Since the beginning of the 20th century, the professional and conscious interest of artists in the textile mosaic technique, based on the study of simple geometric shapes and color relationships, has been connected with artists' desire to engage in crafts, because industrially produced commodities were considered ugly or of poor quality. 20th century decorative art was influenced by the development of technology; as a result, its designs employed many straight lines, sharp corners, and checkerboard motifs (Amoliņa 1999, 26). A striking example of the popularity of abstract patterns in the 20th century is the passion of the Ukrainian-born French artist Sonia Delaunay (1885-1979) for abstract compositions. Delaunay states that around 1911, she had an idea to make a blanket for her newborn son from pieces of fabric, such as she had seen in the homes of Ukrainian peasants. Once it was finished, the arrangement of the fabric pieces made her want to use the same or similar arrangement in her other works. In the 1920s, Delaunay started to regard the creation of textiles as her main form of expression. Developing and perfecting the possibilities provided by textile mosaics, Delaunay created a textile "Composition" of bright geometric squares, and in 1967 it was exhibited at the Lausanne Biennale, in the Hall of Experimental Textiles, where works made from any materials and using any techniques were displayed (Cotton, Junet 2017, 49). In Latvia, Delaunay's contemporary, the painter Aleksandra Beļcova (1892-1981), did not sew herself, but in the 1920s, she drew a sketch for a "Mother and Daughter" panel sewn in the textile mosaic technique (1925-1927) **(Figure 4)**. According to Natalija Jevsejeva (b. 1975), a researcher of A. Beļcova's work, the panel was made to decorate the interior of the society "Baltars" painted porcelain workshop and store. In turn, her inspiration and interest in the application of the textile mosaic technique came from the works of the "Contemporary Decorative Art Exhibition" in Moscow, which included scarves, belts, and pillowcases decorated with supremacist compositions. All the works at the exposition were demonstrated by the "Verbovka" *artel* (company) of modernist artists (Jevsejeva 2019, 235). Beļcova created a total of four sketches of fabric panels for the interior of the "Baltars" store. These panels were sewn by seamstresses.

In the context of Latvian professional textile art in the 1980s, the integration of the textile mosaic technique into textile art was affected by different factors than in the Anglo-Saxon world in the 19th century. Unlike in the US and the UK in the 19th century, integration of the mosaic technique into the repertoire of textile art was not related to health care, or knowledge passed down from generation to generation, or the desire to practice crafts. Instead, it stemmed from an interest in the principles of geometric thinking. In the late 1970s and 1980s, the classic tapestry technique was dominant in Latvian textile art. Working with tapestry, the Latvian artist Henriks Vorkals (1946-2018) became fascinated by the principles of geometric abstraction. Vorkals' textiles were far from the traditional understanding of art in general (Kristbega 2012, 43). Vorkals remembers that his studies with Rūdolfs Heimrāts (1926–1992), the founder of Latvian textile art, naturally led to the principles of geometric thinking. He became interested in geometry first of all because in the planning stage of creating any fabric on the loom, it was necessary to use graph paper for a weaving draft

Fig. 3. Military quilt. Unknown author. Anglo-Zulu War Army Quilt, wool, army uniform. Dimensions 220 x 190 cm. Source: Annette Gero collection / American Folk Art Museum

plan (Kristbega 2012, 43). The artist had to draw a schematic representation of the cloth itself and to indicate warp and weft interlacement. Another example of the application of the principles of geometric thinking in textile art can be seen in the large-format woven textiles by the artist Vera Viduka (1916–1994). Her textile works are based on textile craft studies which gave precedence to ascetic composition with clear geometric squares. Sandra Kalniete writes the following about Viduka's works: "The red and black wave of Barta's skirts has been turned into a magical sign" (Kalniete 1989, 236). When commenting on her embossed works, Viduka says, "It's higher mathematics. All embossed elements are first calculated and cut - as much as needed, not a millimeter higher or lower. That's why the work looks so precise" (Oša 1986, 15).

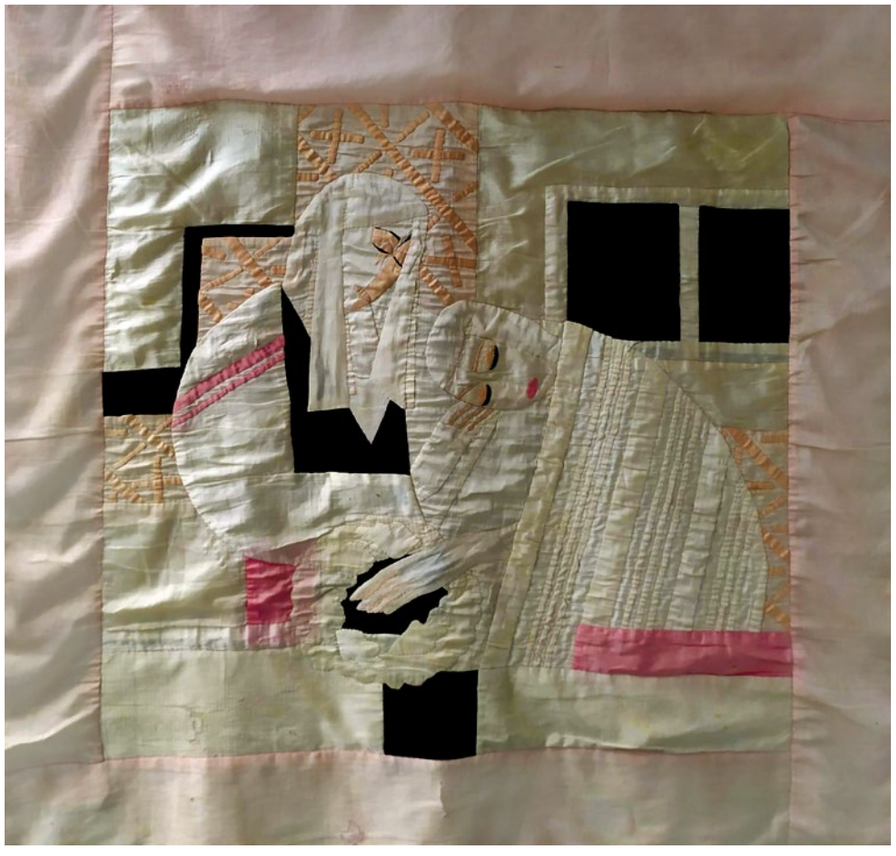

Fig. 4. “Mother and daughter” panel based on the sketch of Aleksandra Beļcova. 1925-1927. Cotton, satin fabric. Dimensions 133 x 137 cm. Exhibited at: LNMM “Aleksandra Beļcova (1892-1981)” exibition, 2021.

In general, in the 1980s several artists, in addition to practicing the tapestry technique also showed interest in other handicraft techniques and new textile construction methods. For example, Ruta Bogustova developed a special technique of felted fabric embossing. In turn, Inese Jakobi (1948), Pēteris Sidars (1948), Raitis Rubenis (1952–1990), Uģis Jankavs (1956), and others experimented with various non-textile materials, such as plastic, paper, stone, metal, wood, etc. Perhaps the impetus in the 1980s to look for new directions in textile art seemed self-evident to the young artist Inta Amoliņa, and therefore she began to systematically devote more and more time to creating her unique artistic language, using geometric elements, such as squares and rectangles, increasingly often. She aspired to connect her newfound artistic language with her knowledge about fabrics and their properties. As Amoliņa has pointed out, information about the development of textile mosaics could not be found in periodicals or books in Soviet Latvia (Veilande-Apine 2022), so she was mostly self-taught. Only after her first textile mosaic works had already been completed, Rudolfs Heimrāts brought to Latvia magazines from abroad which described textile mosaic techniques (Veilande-Apine 2022). One of the first textile mosaic works by Inta Amoliņa

was “Flag”. In his review of “Viņa nēsā apkārt tādas pašas krāsas, kādas ieaužgobelēnā” (“She carries around the same colors that she weaves into the tapestry”), Pēteris Bankovskis draws attention to the interplay of colorful tonally nuanced areas of the composition and argues that a work of textile art, like Amoliņa’s “Flag”, is not just a soft carpet (Bankovskis 1984, 30). He outlines the essence of the textile mosaic technique, where the geometry of straight lines and squares reveals the intersections of the past and the present. We fully agree with Bankovskis’ observation and can also remark that Amoliņa’s “Flag” had a remarkable size for a textile artwork – 40 m², which was probably the largest textile work in Latvia at that time. The production of a textile work on this scale requires constructive thinking in order to build the composition modules step by step, and stitch them together in a thoughtful sequence. Before an artist can sew works in the textile mosaic technique, she needs to collect various fabrics. Most often, these materials are second hand. In addition, Amoliņa’s large-scale textile work was the first in Latvia that was exhibited outdoors. For the first time, her textile work was exhibited during the festival “Mākslas dienas 83” (“Days of Art 83”) in 1983. It was placed on a wall of St. Peter’s church in Old Riga **(Figure 5).** However, Amoliņa’s “Flag” had a wider scope of application. It became a successful accent for the facade of the “Latvija” exhibition hall during the exhibition “Baltijas republiku jauno mākslinieku lietišķi dekoratīvā māksla” (“Decorative Applied Arts by the young artists from the Baltic republics”). In 1984, exhibiting textile works outdoors was a rare phenomenon in the history of Latvian textile art, as it requires finding appropriate materials and adapting them to changing weather conditions. Like mosaic patterns, the variety of textile mosaic techniques is huge. Creating textile mosaics involves stitching and fabric dyeing and requires the study and knowledge of the structure and properties of various fabrics. I. Amoliņa especially emphasizes that her experience before studying at the Art Academy helped her to learn the textile mosaic technique. Before entering the Academy, she had studied for three years at the “Rīgas vieglās rūpniecības tehnikums” (Riga Technical School of the Light Industry) (Veilande-Apine 2022). Later, the tonally saturated textile mosaics based on geometric abstraction gave I. Amoliņa confidence in her skills. Now her works form a notable part of the Latvian textile art school. Several of her works were commissioned for public spaces: in Valka, for the dining room of the collective farm “Padomju Latvija” (Soviet Latvia) (1982), four flags for the World Festival of Youth and Students in Moscow (1985), wall decorations for the Creative House for Composers in Melluži (1988). Since the 1990s, I. Amoliņa has been experimenting with different fabrics, compositions, and techniques. In addition to creating textiles, she also employs the textile mosaic technique to make clothes.

CONCLUSION

One of the goals of this study was to reveal the connection between textile mosaics and natural sciences. Studying the textile mosaic technique reveals an obvious connection of textile mosaics with such sciences as mathematics and physics. When creating a textile mosaic, it is impossible to cut the pieces of the pattern without mathematical calculations. Mathematical calculations also help to ensure that the material is used prudently and thriftily. Secondly, the connection of the technique of textile mosaic with the laws of physics is clearly illustrated by Amoliņa’s large-format work “Flag”. Before creating and exhibiting this textile work on the wall of St Peter’s Church, it was necessary to consider the physical forces that would act on this work in order to be able to choose appropriate materials for it that would be able to support heavy loads and to withstand the effects of various weather conditions, such as wind, rain, and sun. Thirdly, the connection of textile mosaic with health science and psychotherapy is evident in those cases when sewing textile mosaics is used

Fig. 5. Inta Amoliņa. Textile mosaic “Flag”. Exhibited on the wall of St. Peter’s church in Old Riga, “Days of Art 83” exibition. Photo: Atis Ieviņš

in art therapy. A great example of this connection is the sewing of textile mosaics from the 19th century to this day as part of art therapy for the rehabilitation of the United States Army veterans.

However, no direct connection between healthcare practices and textile art has been discovered so far in Latvia. In the 1980s, Latvian artists’ desire to rediscover, and search for, alternative tapestry techniques using textile mosaics became a driving force in the development of textile art in Latvia. What makes Latvian textile art distinct and peculiar is the use of second-hand materials and the recycling of leftover fabrics in the creation of new works of art. Geometric abstraction in textile mosaics is another important peculiarity of professional textile art in Latvia. Textile artists’ in-depth knowledge of the wide range of applications of the textile mosaic technique often helps them to find a laconic and precise solution for the expression of a particular concept. Inta Amoliņa was audacious enough to work with an underappreciated textile technique and her “Flag” is a vivid example of a creative and innovative approach to creating textile artworks.

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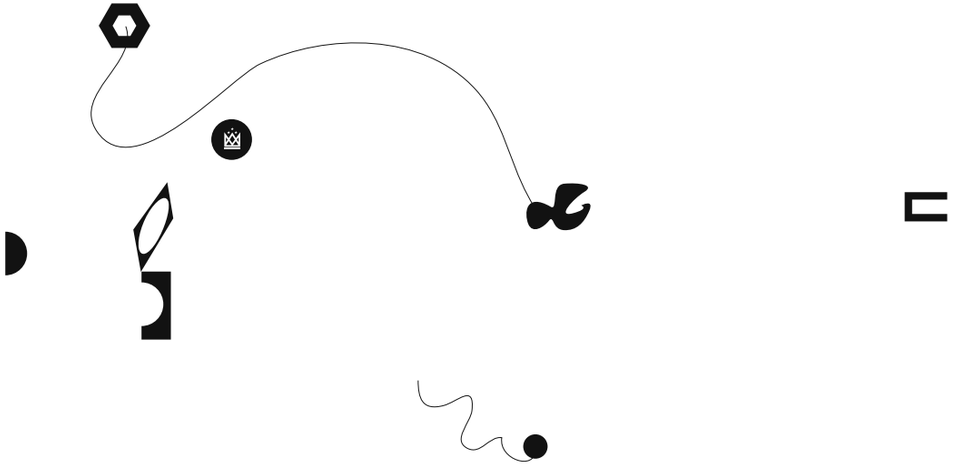
Inta Amoliņa in conversation with Elīna Veilande-Apine. 23.03.2022. Record in the private archive of Elīna Veilande-Apine



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