11th Peripatetic Conference

Art and Science as Ways of Knowing and Experiencing the World: Creativity, Abstraction and Learning

Book of Abstracts

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Keynote lectures

Immersing yourself in an image

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Independent artist

Light is a medium I reach for most willingly, which is why it will constitute a crucial part of my speech. It allows me to immerse myself in incorporeal images, freely pulsating in space, to cross the borders in a way I dreamt about while visiting museums. The arrangements I create stem from this dream and from my considerations on our perception of the world and the ability to change. During my talk, I will look at the journey I have taken from working with line to working with light; from flat surfaces to spatial realizations. I will reflect on the role of my interaction with ephemeral images, the associations evoked, and their impact on my further search.

Art and affordance: interactive artistic exhibits at the science center

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Exhibits at a science center differ in their attendant features and functions. As objects, they fundamentally differ from one another in form, size, and the way they are worked with. Following the criterion of the level of affordance, three basic groups of exhibits can be identified. Within the first group of objects if it is not apparent what is supposed to happen when using an exhibit, the visitor knows that the button has to be pressed, the pedal stepped on, or the knob turned, in other words, the user's perceived affordance of the exhibit dictates what actions will be possible. Another type are exhibits which require one to be confronted with an unfamiliar element. Without instructions or without seeing how another visitor does it, it is difficult to understand the point of the exhibit. The third type of exhibit is an exhibit, which presents multiple options for visitor manipulation and offers new ways to conduct one's own experiments (Gutwill, 2008).

What happens when an exhibit is designed like an art object and, although it contains familiar elements, their function is to focus the visitor's attention on a new, previously unknown use? Most broadly, within the talk I will address two issues. Among the interactive exhibits, a certain group are objects in which scientific issues are conveyed in the language of art. To what extent does the use of artistic means shape affordance in relation to such an exhibit? How does the use of artistic means shape the interaction with the object? Does the use of the language of art increase or decrease the affordability of the interactive exhibit?

These questions will guide our discussion of the recorded interaction with the art exhibit.

Gutwill, J. P., & Allen, S. (2017). Group inquiry at science museum exhibits: Getting visitors to ask juicy questions. Routledge. Jakobsson, A., & Davidsson, E. (2012). Using sociocultural frameworks to understand the significance of interactions at science and technology centers and museums. In Understanding interactions at science centers and museums (pp. 3–21). Sense Brill.

Menary, R., & Gillett, A. (2022). The Tools of Enculturation. Topics in Cognitive Science, 14(2), 363–387.

Norman, D. A. (1999). Affordance, conventions, and design. Interactions, 6(3), 38–43.

I dance therefore I am. On the ontic dimension of dance from choreological-cognitivist perspective

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An experimental notion such as “the thinking body” emerged as early as in the first half of the 20th century through research into physiology of the human movement carried out those days by an American scholar Mabel Elsworth Todd, 1880-1956. She has been credited with establishing a form of somatic education, recognized under a name of Ideokinesis, which aims at developing man’s neuromuscular coordination.

It was her consistent and steadfast academic pursuit of measurable data gathered through investigating into forms and functions of man’s kinetic behaviour that led Mabel Todd eventually to formulating her research inferences on the ground of the exact science. This took place in the thriving scholarly environment of Columbia University, USA, between 1920 and 1930 on. Inevitably, her findings served as a point of departure for positing her epistemological premises in the field of the Humanities. The latter encompasses psychology as well, which on its own coined a term “psychology of movement” for its then novel subbranch. For ultimately subject concurrent research data that derive from physics, mechanics, anatomy and physiology of the human movement converge on psychology. And we assume that it is a branch of science that examins, describes and defines causes, trajectory and outcome of person’s both emotional and mental attitudes and acts that are conveyed through physical gesture.

At the same time in Europe, roughly speaking and timing, Rudolf Laban, 1879-1958, pursued his aesthetic and philosophical studies on the human movement with emphasis being put on man’s

dance behaviour. His both theoretical and artistic activity in the fullness of time brought about the rise of the two methodological approaches in studies of the human movement, namely choreology and choreosophy.

By referring to these classical and relative research stands, of Todd's and of Laban's in turn, that perceive man's kinesthetic mode of behaviour from wholistic and metaphysical vantage point I come up with a concept of dance as some potential both autocreative and creational force that enables human beings to awake, develop and enhance their individual existence. This research stand suggests that dance might achieve a status a self-knowledge developmental tool being used by a dancing subject to probe their inner depths and explore the outer world equally. Most importantly it is a medium or device that can be applied successfully in building up a space of encounter in a dialogue of I-You, I-you and I-them.

Mabel E. Todd, The Thinking Body, London 1997.

S.H. Fraleigh, Dancing Identity. Metaphysics in Motion, Pittsburgh University Press, 2004.

Rudolf Laban, Choreutics, London, 1966.

Wiesna Mond-Kozłowska, Przekraczanie sztuki w meatfizycznym doświadczeniu tańca, Kraków 2010.

Wiesna Mond-Kozłowska, O istocie rytmu, na pograniczach tańca, muzyuki i poezji, Kraków 2011.

Abstraction, Essence, Metaphor: Ways of expressing the unknown in science and in visual art

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This presentation seeks to address the ways in which both art (sculpture, painting, light installations) and scientific models of the world approach the expression of yet unknown or poorly understood aspects of reality. Platonism or immanent realism in philosophy insist that abstract objects (such as 'number'), as well as properties and relations of objects, exist independently of the particulars they instantiate. Whether numbers ('the prime number 7'), or properties ('redness'), or relations ('smaller than'), these are taken to be non-physical, hence non-spatiotemporal, but also non-mental abstractions. Conceptualism (or, psychologism), on the other hand, claims that abstract objects exist but not independently of our mental processes (as was argued, for example, by Husserl in his Philosophy of Arithmetic, 1891/2003).

In this talk I will analyze Husserl's quest to find the essence and origin of 'number' alongside Brancusi's attempt to capture in visual form the essence of 'flight' or 'the newborn's cry'. Does modernist art aim for capturing the essence of an object it represents, or does it evoke it? Can sculpture, for millennia a major medium of representational art, penetrate to the essence of things? How does this compare with so-called primitive art or the Neolithic sculptures of the Cycladic culture of 3000 years BCE? In what sense can we claim that these are abstractions from a visually given shape, rather than a disclosure of a reality that we do not ordinarily see or yet know? Can art then constitute access to what is previously unthought and if so, how is this process different from building up scientific models and explanations of the physical world? The theoretical discussion offered, based on phenomenological analysis, will be supplemented by examples from science and a variety of artistic works.

Receiving artistic message

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Psychological investigations indicate that the experience evoked by an artwork may evolve during the decoding of the encrypted artist's message. This decoding may occur in the same way that information is passed from sender to receiver via an information channel, here the art piece, as described in the information theory proposed by Shannon. In our opinion, transfer of information from the author to audience is critical for the reception of artistic intent, and for the understanding of the experience of art. The information embedded in art, along with its reception, is often implicit, therefore it is not obvious whether the transfer occurred. To test for possible transfer and reception by the audience of the intent and information encoded by the artist, we designed an experiment where the audience was exposed to either artistic or artificial (produced by neural networks) images. Both types of images were presented in the art gallery in a form of regular exhibition and in the laboratory on computer screen. Information collected during the experiment included flow questionnaire, eye tracking and EEG data. Here we present preliminary results of the questionnaire and eye tracking analyses.

Fenomenologia żywiołu filozoficznego (Phenomenology of the Philosophical Element)

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The aim of the presentation is an attempt to reveal and describe the things (pragmata) of philosophy as an element of thinking. It is not about some metaphilosophical reflections on philosophy as an academic discipline, its internal divisions, its method, language, object, history, trends, etc. Starting from a reminder of the selected motifs present in contemporary philosophical literature, which link the metaphor of the element with the fundamental issue of philosophy, I treat the "element" as a correlate of the primordial, existential philosophical experience. In accordance with the large number of different partial experiences that constitute the matter of philosophy and their own requirements to the form of expression, an attempt to reveal the philosophical experience must use various means such as sound, movement, image or gesture. It is possible also that the presentation of the element of thinking can only be successful in the form of a philosophical performance.

M. Foucault, Rządzenie sobą i innymi;

H.-G. Gadamer, Prawda i metoda;

E.A. Havelock, Przedmowa do Platona;

M. Heidegger, Co zwie się myśleniem?;

J. Huizinga, Homo ludens. Zabawa jako źródło kultury;

E. Levinas, Istniejący i istnienie;

F. Nietzsche, Dzieła zebrane;

Platon, Dialogi;

Workshop

Musica Humana: bridging sound with gesture

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1. Just walking and getting in tune with Yourself through movement
2. The feet awakening.
3. Feeling one's breathing and finding the proper rootage in the personal stance.
4. Getting to know one's kinesphere and exploring individual movement potential in space.
5. Short personal warming up according to one's daily routine.
6. Movement improvisation: tracking the way an expressive movement emerges, brought forth by the musica humana (one trigger) or played music (another root).

All workshoppers are suggested to wear casual and comfortable clothing to allow free movement. The ideal condition is to move barefoot. There is a possibility to brush up English movement vocabulary before the workshop sets off.

Talks & Posters

The Matter of Code

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The Matter of Code is a story about the practice that eliminates the polarization of code and matter. The code, seen as a material, has unique properties. It combines physical and digital matter that does not produce a simple sum. Its emergent properties allow the creation of unique experiences that are otherwise unattainable. Code's material manifestation can be seen as complex installations that react to environmental stimuli, changing the understanding of space and its perceptions and subsequently affecting human emotions.

Every designer, artist, or architect can use The Matter of Code in his creative workshop without needing a degree in technical disciplines as the barrier of entry has dropped intensely. The simplification of digital technology, open source and open hardware movements, DIY culture, and the development of IDE for creative coding has allowed everyone to master code as material through experience — in the same way as a sculptor learning to shape wood, stone, or clay.

The Matter of Code crosses the boundaries between art, design, and science. It is further emphasizing its presence in many areas of creation. The Matter of Code practice is a call to start thinking

in an anti-disciplinary way, to forget about the stereotypical divisions between the humanistic and scientific mind, and change the passive recipients of technology into its active creators.

In the words of Douglas Rushkoff, readers become writers, get access to the civilization control panel, and gain a voice in the discussion about our future. They hack how technology is used, find unexplored areas of code usage, and explore seemingly impossible connections at the junction of the physical and digital worlds.

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[2] Dourish, P. (2001). Where the action is: the foundations of embodied interaction. MIT press.

[3] Składanek, M. (2017). Sztuka generatywna: metoda i praktyki. Wydawnictwo Uniwersytetu Łódzkiego.

[4] Pallasmaa, J. (2012). The eyes of the skin: Architecture and the senses. John Wiley & Sons.

[5] Kluszczyński, R. W. (2010). Sztuka interaktywna: od dzieła-instrumentu do interaktywnego spektaklu. Wydawnictwa Akademickie i Profesjonalne.

When the beauty is felt: awe in psychology

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Awe-evoking moments are often described as turning points that inspired further action and meaning formation in life. The emotion of awe tends to be a particularly important factor for a successful creative process, and trait awe is a significant predictor of academic and more generally- 'creative' performance. Stimuli capable of inducing awe are defined as vast (in any perceptual dimension) and causing a need for accommodation. At the same time, awe-evoking stimuli differ substantially with regard to their source. Both scientists and artists can be considered candidates for experiencing awe relatively more often due to the type of mental

process behind producing works of art and scientific discoveries. Their work environment fosters acknowledging the existence of abstract forms that are vast and incomprehensible. They are also often responsible for production of such forms. Yet, to date, awe received much less attention in science due to its associations with spirituality and subjective character. I hope to spark discussion on admitting the importance of emotion in the intellectual and creative process.

In my presentation, I would like to discuss the effect that awe has on people. Findings point to significant impact of state and trait awe on pro-social behavior and time perception. As my area of interest is human-nature relationship, I would like to emphasize how feeling awe can bring about very 'solid' results in terms of donating to environmental issues. I will briefly present the conceptual architecture of two studies I plan to conduct that are related to the subject. First aims at analyzing the relationship between trait awe and the three-layered concept of self – self as an agent, actor and author (McAdams)- and second uses methods from the microeconomics to establish whether and to what extent willingness to pay for environmental protection differs in people with respect to trait awe and how it is mediated by changes to the self-concept.

Alice Chirico, Vlad Petre Glaveanu, Pietro Cipresso, Giuseppe Riva & Andrea Gaggioli (2018) Awe Enhances Creative Thinking: An Experimental Study, Creativity Research Journal, 30:2, 123-131, DOI: 10.1080/10400419.2018.1446491

Keltner, D., & Haidt, J. (2003). Approaching awe, a moral, spiritual, and aesthetic emotion. Cognition and Emotion, 17(2), 297–314

McAdams, D. P. (2013). The psychological self as actor, agent, and author. Perspectives on Psychological Science, 8(3), 272–295

Piff, P. K., Dietze, P., Feinberg, M., Stancato, D. M., & Keltner, D. (2015). Awe, the small self, and prosocial behavior. Journal of Personality and Social Psychology, 108(6), 883

Silvia, P. J., Fayn, K., Nusbaum, E. C., & Beaty, R. E. (2015). Openness to experience and awe in response to nature and music: Personality and profound aesthetic experiences. Psychology of Aesthetics, Creativity, and the Arts, 9(4), 376

Musing about Henri Poincaré's "Mathematical Creation": Fractal Jigsaw Puzzles and Computational Aesthetics

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Henri Poincaré was a French mathematician, theoretical physicist, engineer, and philosopher of science. In 1910, he published a classical essay on creativity in the work of a mathematician. In my talk, I will present the main hypotheses of this essay and I will comment on them from my own mathematical perspective. I will develop Poincaré's ideas into a fractal jigsaw puzzle metaphor of mathematicians' work. Namely, I will compare doing mathematics to arranging a jigsaw puzzle with a hidden image on it that appeals to the aesthetic sense. If we could guess somehow this hidden image beforehand, then the knowledge of the image would reduce the time complexity of puzzle arrangement from exponential to quadratic. If the hidden image were a fractal, being an example of a rare beautiful mathematical object, then it would pay off to guess the hidden image by trial and error rather than assemble the puzzle by brute force search. As a result, the fractal jigsaw puzzle metaphor raises a few open questions about philosophy, aesthetics, structure, teaching, and automation of mathematics.

H. Poincaré, 1910. Mathematical Creation. The Monist, Vol. XX.

Searching for multimodality in the brain – a graphophonology hypothesis

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Learning to read requires developing effective multimodal integration between sounds of words (phonemes) and visual signs (graphemes). Previous behavioral research established a bidirectional link between phonology and orthography development. There is evidence on automatic involuntary influence of one process to another like orthographic intrusion in phonology or deficit of metaphonological skills in illiterates. Also in a brain reading network we found multimodal hubs processing both phonology, orthography or integration processes. This cross-modal activation might be explained by the development of multimodal graphophonology representations crucial for reading. During my presentation I will present methods of testing this hypothesis on a neural level.

Storytelling in Copernicus Science Centre

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Talking about physical phenomena is often boring. At the Copernicus Science Centre, we face reluctance and weariness when interacting with our visitors. Therefore, we try many different solutions and tools to elevate interest among them. One of the methods that becoming more and more popular among sciences communicators is story telling. By working with two science shows: “Face the love” and “Sea stories”, we explore the possibility of using stories to spark stronger attention of our audience. Aroused emotions allow us to transport viewers into the world of imaginations, feelings, and opinions. We try to shift from the world of knowledge and scientific research on different topics, to our everyday lives.

Moreover, during the COVID-19 lockdown, we tried including narratives into two of our online formats.

- The first format were fairy tales dedicated for children, which included simple experiments.

- The second format focused on the beauty of physical phenomena that often elude us. By adding music, sounds and images we tried to tell an abstract story along with an invitation for the short moment of contemplation.

Ettinger, J., Otto, F.E.L., Schipper, F.L. 2021. Storytelling Can Be a Powerful Tool for Science. Nature, 589, 352.

Ettinger, J. 2020. What Hollywood can teach researchers about science storytelling. Nature (Online).

Experiencing the World Through Dance

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Dance is culturally universal, and has probably always been part of the human condition. As it leaves no traces, it is unclear how long dancing has existed, but it may be up to 1.8 million years old. The oldest depictions of dance are in cave paintings in Borneo, made between 13,600 and 20,000 years ago.

Dance has important functions in rituals, story-telling, collective positive emotion, and it has significant motivational and health benefits. Intrinsically a social activity, it seems that dance has important functions in group cohesion and social bonding, both of which are important in the peaceful emergence and continuation of large groups of people, and therefore for society. When dancing, we focus on the feel and movement of our body in space, as well as the space around us and others in it. Through dance, we can learn more about ourselves, our environment, and the people around

us. Dance therefore provides an ideal pathway to increase self-knowledge, interact with others, and explore and experience the world around us.

Despite the importance of dance in a social context, the feelings of 'togetherness' that dance is capable of eliciting can be difficult to quantify. In this talk, I will summarise, from both behavioural and neuroscientific perspectives, how this has been explored in the field to date. I will also discuss possible future directions that may help to deepen our understanding of how we use dance to experience and explore the world.

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Karpati, F. J., Giacosa, C., Foster, N. E. V., Penhune, V. B., & Hyde, K. L. (2015). Dance and the brain: A review. Annals of the New York Academy of Sciences, 1337. https://doi.org/10.1111/nyas.12632

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Contextual communication without information processing: modelling results and theoretical insights.

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Although the role of context in linguistic communication has usually been seen as secondary in the main branches of language sciences, the need to explain the complex interplay between language and environment in generating meaning is now increasingly recognized. I will briefly review the available accounts of the function that context-sensitivity plays in language use. Next, I will present our recent modelling effort, where we explore the conditions for context-sensitive communication within a variant of Lewis' (1969) signalling problem with limited item choice and a soft constraint on the vocabulary size. The results suggest that for contextual communication to appear, the sender must be able to access the context and additional pressure must be present.

Beside the results of our modelling experiments, I will provide, perhaps even more importantly, some theoretical insights inspired by our work on the model. It seems that the environment can play a double role in contextual communication: both constraining the agent's actions and acting as a source of information that impacts language interpretation.

Lazaridou, A., Hermann, K. M., Tuyls, K., & Clark, S. (2018). Emergence of Linguistic Communication from Referential Games with Symbolic and Pixel Input. ArXiv:1804.03984 [Cs]. http://arxiv.org/abs/1804.03984

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Winters, J., Kirby, S., & Smith, K. (2018). Contextual predictability shapes signal autonomy. Cognition, 176, 15-30.

The physiology of flow in divergent thinking

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The state of flow is a well-recognized aspect of the creative process. The physiological component of the flow state has been found to involve inverted-u-shaped relationship between HRV and flow in gaming performance (Bian 2016). Moreover, LF/HF ratio has been reported as the most important feature to classify low and high flow via machine learning (Rissler 2020) However, the HRV changes accompanying creative processes have not been extensively investigated up to date. In this study, creativity was measured as divergent thinking during the Alternative Uses Task, using five words (umbrella, shoe, soap, pen, and brick). ECG data was recorded from healthy participants as they performed the task. Seven indices were calculated from the ECG signal including the spectral components: VLF, LF, HF, TP, and LF/HF (i.e. very low, low and high frequency band power, total power, and the low-to-high frequency power ratio) as well as measures of standard deviation of the inter-beat intervals of the heart: SDNN and RMSSD (i.e. standard deviation of the mean and root-mean-square of the SDNN). Creativity was operationalized as indices of divergent thinking, including fluency (the number of valid alternative uses generated by the participant), originality (the uniqueness of the participant's ideas in the analyzed sample), and average originality per idea (originality divided by fluency). Response assessment indicated that difficulty level varied across the 5 words used. The participants generated most alternative uses for 'umbrella' and least for 'soap' (the difference was statistically significantly at $p < 0.001$). These two words defined the 'easy' and 'hard' condition. Regression analysis revealed that for both easy and hard condition, higher fluency and average originality of ideas was predicted by increased LF/HF power ratio. Low frequency power represents baroreceptor activity and is known to increase upon HRV-biofeedback training and in meditative states. The presented results suggest a link between these mental states and the flow experienced during creative processes.

Bian, Y., Yang, C., Gao, F., Li, H., Zhou, S., Li, H., ... & Meng, X. (2016). A framework for physiological indicators of flow in VR games: construction and preliminary evaluation. Personal and Ubiquitous Computing, 20(5), 821-832.

Rissler, R., Nadj, M., Li, M. X., Loewe, N., Knierim, M. T., & Maedche, A. (2020). To be or not to be in flow at work: physiological classification of flow using machine learning. IEEE transactions on affective computing.

Embodied constraints for abstract concepts processing: The case of finger counting

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The Spatial-Numerical Association of Response Codes (SNARC) effect (i.e., faster left/right side responses to small/large magnitude numbers, respectively) is considered to be strong evidence for the link between numbers and space. Studies have shown considerable variation in this effect. Among the factors determining individual differences in the SNARC effect is the hand an individual uses to start the finger counting sequence. Left-starters show a stronger and less variable SNARC effect than right-starters, what is consistent with the direction of the mental number line. This observation has been used as an argument for the embodied nature of the SNARC effect. Also, the results of numerous educational interventions and early numeracy trainings involving bodily activities suggest that the acquisition of mathematical concepts should be elucidated within the embodied framework. On the other hand, it is still not clear whether the role of the embodiment is constitutive or only facilitative for mathematical cognition. Moreover, there is a recent discussion on whether "embodied effects" reflect general mechanisms of abstract concepts processing or, rather, form a new avenue for exploring individual differences in mathematical cognition. Here, I will focus on both recent theoretical discussions in the field and present our experiments on the role of finger-counting routines in shaping spatial-numerical associations.

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https://doi.org/10.7717/peerj.5878

Conceptual blending in art and science

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In this paper, I will show how the theory of conceptual blending allows us to understand certain aspects of creativity. The research material will be ancient Indian conceptions of the cosmos, expressed in poetic texts and works of art. I will also present the hypothesis that conceptual blending theory is suitable for understanding certain aspects of quantum physics (based on their discussions presented by great physicists such as Stephen Hawking). As Turner (2006) argues, the ability to create complex blends allow us to create and understand concepts and ideas beyond the everyday logic. Since some basic intuitions are similar in both conceptions of the cosmos, one can ask whether and to what extent the ability to create blends guides our cognition.

Turner M. 2006. 'The Art of Compression'. In: Turner M (ed.). The Artful Mind Cognitive Science and the Riddle of Human Creativity. 93-114. Oxford: Oxford University Press.

Dancing with wolves – a few more reflections on the use of distance-signaling structures in Polish

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The aim of the present paper is to consider once again the use of distance-signaling structures in Polish, in particular with regard to the question of the extent to which this use is dictated by the linguistic conventions of Polish. The discussion in the paper will be organized in the following way: first, the conventional patterns of using distance-signaling structures in Polish will be discussed; then selected examples will be considered in which the use of a distance signaling structure seems to constitute a violation of a conventional pattern; finally, an analysis will be offered which will – hopefully – account for both uses conforming to conventionalized patterns and uses violating them.

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Abstract Nature Photography: From Artistic Vison to Scientific Questions

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Abstract nature photography is a special type of visual art that appeals to the viewer primarily through its form and not its content. No knowledge about the cognitive processes and neurobiological foundations of aesthetic experience is necessary to create or admire this kind of art. However, the fact that some photographs delight us and others leave us indifferent, arouses natural curiosity. It is also interesting how the application of specific artistic techniques significantly contributes to the reception of artistic works.

In my presentation, I will present some of my fine-art photography and discuss the process of their creation. I will discuss how professional photographer's experience and intuition can be an important contribution to scientific research on the processes of perception, recognition, and response to visual stimuli, in particular on the phenomenon of aesthetic experience.

Tinkering, tools and new ideas – the Nencki Open Lab project

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The claim that neuroscience needs new ideas is nowadays almost a cliche. Proponents of this claim argue than despite huge progress in the development of methods we still lack theories that would allow us to make sense of the data we obtain (Barack & Krakauer, 2021; Guest & Martin, 2021b; Laplane et al., 2019). It is being suggested that neuroscientists should spend more time on theory development and creating new ideas.

Other reasearchers (Bickle, 2021), though, contradict this view, claiming that the development of neuroscience is not guided by the development of theories and new ideas, but by "tinkering in the lab", i.e. invention of new tools that is not theory-driven, but based on trial and error tinkering. Those tools, in turn, enable new discoveries.

Our Nencki Open Lab Project that embraces both of those views. On one hand, it focuses on teaching neuroscientists tools and skills that allow them to tinker in their labs – developing experimental tools. Our workshops and summer schools are designed in a manner that fosters creative, exploratory approach.

Simultaneously, we have created the Nencki School of Ideas of Neuroscience. The goal of this part of our project is to create a space for a free exchange of ideas, discussion and the development of new theories. We try to teach people how to create new ideas and implement them in their reseach. We foster an environment that is open to free exploration, but constrained in a manner that doesn't allow it to disintegrate.

In my presentation I would like to explain the structure of our project and show what tool development and creating new ideas have in common, requiring creativity and space and time for exploration; and that they can lead to new insights, and should be simultaneously implemented in neuroscience curricula.

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Laplane, L., Mantovani, P., Adolphs, R., Chang, H., Mantovani, A., McFall-Ngai, M., ... & Pradeu, T. (2019). Why science needs philosophy. Proceedings of the National Academy of Sciences, 116(10), 3948-3952.

Subjectification of nature. How can it benefit the nature? How can it benefit us?

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In 2008, Ecuador became the first country that defined nature as a subject of constitutional rights. Such redefinition of nature is often seen as a chance to create policies that would be able to better protect the environment. Recently, the discussion about the rights of nature is centered around such topics as climate change, planetary boundaries, or, more locally, ecological disaster in the Oder river.

In this talk, inspired by these discussions, I would like to examine the subjectification of nature in a broader array of topics. In western science and industry, nature is typically seen as a resource. I will show examples from folk knowledge, art, literature, and industry in which nature is or can be already seen as a subject. I will propose a reorganization of our relation with nature. Based on this new relation, I will show how certain findings can be reinterpreted and how this new approach can benefit our well-being.

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Perceptual access to visual stimuli associated with fear and disgust

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Emotion is the lifeblood of artistic creation and a foundational aspect of art reception. However, perception of emotionally-laden objects operates not only at the level of aesthetic experience, but also at the most basic levels of visual processing. For example, while stimuli signaling threat entertain preferential access to visual awareness, disgust-related objects tend to be visually suppressed. These directional effects are irreducible to the enhanced physiological arousal that accompanies both fear and disgust. On that basis, we hypothesized that arousal should exert different influences on perceptual processing of emotion-related stimuli, depending on the broader physiological co-activation pattern in which it is situated. In my presentation, I will present the results of two studies in which we used an accuracy-based breaking continuous flash suppression paradigm and adaptive staircase procedures to examine perceptual performance for neutral, fear-conditioned, and disgust-conditioned stimuli at threshold-level presentation times. In each of the experiments, we used both localization and discrimination tasks to explore which kind of information about an emotionally relevant stimulus is differentially processed and whether it depends on the specific emotion type. The study is currently being conducted at the University of Warsaw.

How the feeling of togetherness emerges in improvised dance duets?

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The meaning of dance goes beyond pure aesthetics. We argue that by studying dance we may learn a lot about social interactions and skills necessary for participation in them. In this work we investigate the feeling of togetherness as it emerges between two persons dancing a contact improvisation duet. We approach dance as a story enfolding on multiple levels. First, there is a level of physical movement: relation between two bodies in space, the dynamics of their motions, pauses full of anticipation, episodes of mirroring or complementary gestures, touch and weight sharing (third person perspective). Second, there is participants' experience: whatever they sense, feel and think during the dance, and how this evolves through time (first person perspective). We seek to bring together these two levels. To this end we recorded eight dance duets of experienced improvisers. After each dance we conducted in-depth interviews with dancers using recorded videos as prompts facilitating recall. The dance recordings were coded using categories inspired by Marie Overlie's Six Viewpoints – a technique used by choreographers and performers to focus on different aspects of dance. The interviews were transcribed and analyzed qualitatively with the focus on both convergent and divergent experiences. We present initial results of the analyses, showing how even simple movements become deeply social in interaction. We also open a discussion on methodological challenges of the study of natural embodied interactions.

The impact of the dynamism of painting images on the aesthetic experience of viewers and the relationship of aesthetic experience to personality

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Aesthetic experience in the field of art psychology is a vast subject. There are many definitions of this phenomenon, but there is no single research tool that all researchers accept (Swami & Furnham, 2015). The concept of aesthetic experience that I used in my study is that proposed by Csikszentmihalyi and Robinson (1990), which states that aesthetic experience involves not only the reception of art, but also the experience of flow, and consists of five dimensions: emotional, cognitive, perceptual, communicative and flow. This model was confirmed and then modified in a study by Wazner and Finley (2018). The researchers identified a total of six subscales-four examining the art experience and two related to the flow state. My study aimed to investigate how strong aesthetic experience appears in art viewers depending on the dynamics of the painting works, and how this relates to the personality of the subjects. The study took place individually with each subject at one meeting during which personality traits (NEO-FFI), and aesthetic experience (Aesthetic Experience Questionnaire) were measured. Each person received the same set of ten images in different order. In the study, I expected that viewing dynamic paintings would result in a stronger aesthetic experience, including a state of flow, and that higher openness to experience would correlate with a stronger aesthetic experience with dynamic works. It was shown that there are differences in the emerging aesthetic experience depending on the dynamism of the work—static paintings caused a higher aesthetic experience in viewers. Also, the flow state was higher when viewing static works. The relationship between openness to experience, and aesthetic experience was also confirmed, with a stronger correlation appearing with static paintings.

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Making / Things

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Contemporary New Craft means, first of all, the hands-on control of the maker over the entire production process. A product made by a craftsperson is different from a factory-made good because it is not alienated. And it is not that there are no machines involved in craft production; the thing is that the relationship between the product and the maker are different, as it is based on complex bodily knowledge. Craftspeople, like musicians, create with their whole bodies. Three key elements – the material, the human, and the tool – constantly change and modify each other. The thing that gets made is not a fetish, but a witness to the human ability to collaborate with the matter of the world.

"Becoming a ceramist is constant learning, about the material, but also about my predecessors and their products. My practice is based on reliable craftsmanship, regular repetition of activities, understanding the material's properties and using this knowledge in my daily work." – Olga Milczyńska, artist and ceramist.

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[2] Rams, D. (1995). Weniger, aber besser: Less but better. Jo Klatt, Design+ Design Verlag.

Deep dreaming and the unfolding of scientific ideas

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My talk will be built around the concept of deep dreaming used in both literal and frivolous senses. (1) Literally speaking, the Deep-Dream is a form of machine learning-based image processing technique that allows the identification and visual enhancement of arbitrarily chosen patterns or motifs. It has seen numerous artistic applications, being one of the flagship examples of so-called AI-generated art. I plan to use this technique in my current project to generate qualitatively distinct hallucinations layered over panoramic videos of natural scenes (viewed through a VR headset), in order to evoke the feelings of being in an altered state of mind. Given how little is known about the possible psychological effects of various hallucinatory experiences, the mere choice of directions here seems largely a matter of intuition. While it seems obligatory for scientists to be able to give explicit value-based justifications for their choices, artists can let their works speak for themselves without pre-specifying their meaning – as if leaving it open to be worked out through collective reception and interpretation. (2) Also, to make a somewhat frivolous point, the core idea of the project originated from "deep-day-dreaming" rather than from meticulous scientific reasoning. I became seized by the urge to find a way to imagine changes in the state of consciousness as a continually sub-branching and reintegrating stream over a space of possible states. The concomitant feeling hinted at the promise of something important to unfold in the process of reflecting on all the twists and impasses, through which a bunch of

long-standing philosophical metaphors could hopefully be turned into something that could be called a scientific proposal. At the price of giving up some of the deep vagueness, this was done by making references to sufficiently concrete, measurable phenomena, as well as formalization efforts.

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Designing The Future as a Practice of Thinking (in) Movement

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My presentation aims to discuss how we can recognize designing different models of futures as an expression of the process of thinking (in) movement. In this context, I understand various models of the future as living and vital communities, becoming different bodily relationships and the connection between the human and the non-human. Thinking (in) movement is the entanglement of mind practices, in this case, derived from the philosophy recognise as a specific field of knowledge and body practices aimed at expanding bodily awareness and mindfulness in motion, derived from contemporary dance, meditation, martial arts, and performance. All those processes can be understood as an expression of the self-organization of matter. I pose questions about the possibility of creating communities that arise in the conditions of dynamic planetary changes, considered precisely as various variants of the materialization of the future. From this perspective, I consider the thinking (in) movement as a transdisciplinary field of knowledge capable of designing alternative models of the future.

The broader context for my reflections is the widely developed debate on the Anthropocene in environmental humanities. The

concept proposed by the biologist Eugene F. Stoermer and the atmosphere researcher Paul J. Crutzen, denoting a new geological epoch, was to indicate the critical importance of human activity in shaping planetary processes related to the climate. Studies related to the Anthropocene, in most cases, direct our attention to the belief that life on Earth is doomed to destruction, caused by humankind. This state of affairs is to be expressed in overlapping economic, climatic, social, and cultural crises. It can be concluded that the Anthropocene concept represents a loss of ontological imagination, and thus the ability to develop long-term visions of the future. Expanding considerations in the field of posthumanism and the new materialism, I would like to show a different path.

- Mroczkowski, B. (2015). Zoe. Wieczny obieg życia. Inspiracje w filozofii i popkulturze. W C. Mielczarski (Red.), Antyk i współczesność. Recepcja filozofii starożytnej w myśli współczesnej. Od czasów Nietzschego do początków XX wieku (s. 241–262). Wydawnictwo Naukowe Sub Lupa.

- Mroczkowski, B. (2017). Schizofreniczna materia. O produkcji ciał, pojęć i podmiotowości. Praktyka teoretyczna, 25(3), 342–353.

- Mroczkowski, B. (2021). Performatywność sztuk walki: Jak agresja zaczyna mieć znaczenie. Czas Kultury, 211(4), 171–178.

Narrative studies as a link between scientific method and leisure reading & storytelling

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Reading, a skill most likely “invented” with writing for bookkeeping purposes, has been widely used for education and leisure as well. However, these different goals demand disparate modes of information processing, leading to specification of subtypes of the activity. The discrimination draws upon the type of scrutinized text, oftentimes taking into account the readers and their feats, preferences, and behaviors. During my presentation, I would like to introduce the audience to the category of reading known as “literary reading” (citation), tightly connected to reading for leisure,

and characterize methods of conducting research in this area. The approaches, oftentimes falling under the category of "narrative studies", have evolved, from structuralist focus solely on the form of the text, via run parallelly psychological and neuroimaging experiments conducted on groups of people and inferential statistics, to a place where both lines of research are combined, adding a single first-person perspective and self-reports, and multi-modal observations of behavior during reading. At last, I will briefly discuss the difficulties in reaching a conclusion that could unite all the aforementioned approaches, and, finally, try to answer the arising question: "What is the pleasure in researching reading?".

Fractals – a formula for creativity

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"Beautiful, damn hard, increasingly useful. That's fractals" – in the words of Benoît Mandelbrot, the father of fractal geometry, defines the subject of his studies. Although mathematical concepts behind fractals are indeed very complex, even a layman can recognize self-similar patterns in the nature. They can be observed in the structures of trees, mountains and coastlines. Cognitive scientists use fractals and fractal dimensions to describe processes like self-similar structure of human performance, while computer scientists use them to create immersive experiences in the field of VR and game development. Fractals are also commonly used by artists. Some self-similar patters can be found in pieces of art, created way before mathematicians defined them as fractals.

In our presentation, by putting side by side, these intricate patterns of nature and art together with recent applications of fractal geometry, we put forth the proposition that the study of these rough, self-similar shapes can get us closer to discovering the creative principle of the universe.

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Cristea, Adrian & Liarokapis, Fotis. (2015). Fractal Nature – Generating Realistic Terrains for Games. 1-8. 10.1109/VS-GAMES.2015.7295776.

Van Orden, G. C., Holden, J. G., & Turvey, M. T. (2003). Self-organization of cognitive performance. Journal of Experimental Psychology: General, 132(3), 331–350. https://doi.org/10.1037/0096-3445.132.3.331

From affection to anxiety: a review of Collin Ellard's book: "Places of the heart. The psychogeography of everyday life".

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Presentation of the review of the book "Places of the heart. Psychogeography of everyday life" by Collin Ellard, a neuroscientist and a professor at the University of Waterloo. Ellard offers an overview of many studies from the anthropology, psychology, philosophy, art, and neuroscience that try to explain how surroundings influence human senses, emotions, and behavior. He focuses on explaining the discrepancies between nature and human-built environments. Human habitats, nevertheless of scale, varies across the globe. However, the feelings a place can induce in people: from affection and boredom to anxiety, are unitary. An extensive part of the book is devoted to the relationship between memory and the experience of space, and how unaware people can be of the influence surroundings pose on them. The author is not afraid to answer questions about the future of design. He gives examples from research labs and artists equipping the space of houses with sensors that could be responsive to a person's physiology and possibly affect their sense of well-being. Ellard is quite fond of new technology and gives several examples from his research, where he used virtual reality. The many findings and theories should be particularly helpful for architects, urbanists, investors, interior designers, and artists to make informed decisions.

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Tortured artists: how anger and sadness influence creative processes

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The link between emotions and creativity remains a popular topic of contemporary research. Several studies have attempted to explain when and why emotions influence creative processes, proposing theoretical models including the Dual Pathway to creativity Model. It assumes that two significant factors play a part in the relationship between emotions and creativity: activation (i.e. arousal), and hedonic tone (which divides emotions into negative and positive). Research has confirmed the beneficial influence of activating emotions on creative processes, regardless of the hedonic tone. The presented project aimed at a deeper verification of the proposed model. Differential influence of both activating and deactivating negative emotions on creative processes was analyzed and further investigated with respect to individual levels of creative skills. During two experimental sessions, the subjects watched compilations of emotional movie scenes selected from a standardized database. Two conditions differed in the type of evoked emotions: activating emotions (anger) or deactivating emotions (sadness). The order of the sessions was reversed for half of the subjects. After the presentation of the film stimuli, the evoked emotions were measured, and then the subjects were asked to either write a short cinquain poem or make an artistic collage. The artworks were evaluated by a panel of qualified judges. Finally, the level of emotion was measured. A differentiating effect of arousal was obtained. Nevertheless, the expected overall positive effect of activating emotions on the creative process was not observed. However, for those who wrote poems, when the individual level of performance creativity (which is strongly connected to poetry) was taken into account, the expected differences occurred in less creative individuals. Thus, an important role of individual level of creativity in the relationship between emotions and creative processes can be inferred. The project also provided some evidence for the contribution of creative tasks to emotion regulation, while setting an interesting direction for further research.

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EEG microstate neurodynamics of creative processes

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The microstate neurodynamics related to creativity have been investigated in design tasks (Nguyen 2015), creative idea generation and evaluation (Jia & Zeng 2021) and resting-state (Wu 2020). However, this study is possibly the first one to use microstate EEG analysis for divergent thinking. The EEG signal was collected from young healthy participants upon the Alternative Uses Task with five words (umbrella, shoe, soap, pen, and brick). Creative performance of each participant was assessed as fluency (the number of valid alternative uses generated) and average idea originality (idea uniqueness in the analyzed sample). Fluency assessment revealed that generating alternative uses for 'umbrella' was easiest, and for 'soap' was hardest ($p < 0.001$). Microstate EEG analysis revealed 8 microstate classes, named after topographies previously reported in the literature. For each class, 3 parameters were calculated: occurrence (the number of times a given class is dominant per second), duration (the average time-lapse a given class is dominant), and coverage (the percent of total recording

time a given class is dominant). The participants were divided into two groups based on the median value of fluency and average originality achieved for 'umbrella' and 'soap'. Microstate parameters were compared between groups by analysis of variance. The results revealed that greater fluency was related to lower activity of topographies A and D, suggesting less phonological/abstract and visual processing, as well as decreased external attention/cognitive control and memory recall. On the contrary, the activity of microstate F was upregulated, which might represent more internally directed attention. Enhanced average originality was represented by decreased activity of class A and more active classes E and F, possibly expressing diminished phonological/abstract processing, and increased visually-guided somatosensory and affective control and internal attention. A significant interaction between fluency and average originality levels was revealed for microstate E, as higher activity of this state differentiated highly original participants with more ideas from those less fluent (no differences were detected for the less original subjects). This might reflect the positive emotionality of the flow state experienced by the most creative participants. All in all, more creative individuals appear to focus their attention rather internally than externally, favoring imagination over semantic and visual processing of the word displayed.

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Beauty as an anticipatory hopeful coherence

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Many 'grand' forces were evoked to account for the organization and function of living beings. Among them: seeking homeostasis, maximal entropy production, or seeking adaptation to external conditions though natural selection. Can of such forces, or their tensions, be helpful for thinking about aesthetics and creativity?

One of such forces that seems to have received less attention is a coherence, or a kind of unity, of experience. In his oft (mis)quoted phrase, William James wrote about the blooming, buzzing confusion, but he wrote about it as being "one", "as free from contradiction in its much at-onceness as it is all alive and evidently there" (1911), about "the original extents or bignesses of all the sensations (...) [coming] to our notice at once, coalesced together into one and the same space"(1890). However, unlike in some homeostatic views, this coherence of experience is not of the kind that seeks a stable state but rather one which chooses a line through the tensions among many values and presupposes change rather than stability.

Recently researchers come back to such ideas of oneness, some of them (e.g., Mannella and Tummolini, 2022), creating computational models, in which internal coherence is a motivating force behind exploratory activities of an organism in the face of change and need for flexibility.

In my talk I will try to lean on these ideas to ask if the active anticipatory systems (in the sense of Rosen or Bickhard), seeking experiential coherence, may create their own unpredictability through art, as an "ucieczka do przodu" (perception on our own conditions) in an inherently unpredictable world? This active way of dealing with reality would also open a way to give life's own values, that of hope and striving, to a reality, which may not seem/be inherently friendly to them.

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motivated learning: The grounding by competence acquisition hypothesis. Philosophical Transactions B

Limits of ergodicity in communication in biological systems

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The purpose of the paper is to highlight a key assumption of the Shannonian information theory, that is often overlooked in the application of information theory to biological systems: namely, the assumption of ergodicity.

The mathematical apparatus of information theory hinges on assuming that the information source (the sender) can be modeled as an ergodic (stationary) probability distribution. This is sufficiently fulfilled in the case of standard engineered communication systems. However, as information theory applications to biology grew, this assumption remained unchallenged. Importantly, biological systems are commonly taken to be non-ergodic (non-stationary), and hence the assumption is not met. Consider information theoretic descriptions of neural activity: they begin with an assumption of a stable probability density function and proceed in most cases ignoring the constant dynamic remodeling that the brain undergoes—which defeats the stability of the probability distribution function, and hence breaks ergodicity.

The paper takes a perspective of philosophy of science, scrutinizing the epistemic role of the ergodicity assumption as an idealization, pointing out to features which in result land outside

the scope of information-theoretic descriptions of the brain activity, and suggesting which existing developments in probability and dynamic systems theory can be used to provide alternative, non-ergodic descriptions which would be able to highlight the phenomena outside the scope of standard information theory.

Introduction to Neuroaesthetics: A Guide to Art's Possible Applications

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This presentation takes as its goal a review of current knowledge in neuroaesthetics, and posits the question of art's 'usefulness' on the social and individual level. Neuroscience and evolutionary psychology share the view that art can be seen as s form of communicating phenomenological states between creator and viewer, as well as between two viewers. Neuroscientific approaches focus on mirror neuron network activations, while evolutionary psychology's perspective sees art as a carrier of tradition and a solidifier of social bonds. Through the mix of art's introspective and communicating qualities, it facilitates the understanding of oneself and others. This teaches people who spend time around art, perspective-taking and the ability to expand one's awareness beyond here and now. Lastly, this presentation aims to suggest that art's qualities give it a therapeutic potential which could be considered in designing museum exhibitions or enabling access to museums, or online art (such as movies, online galleries, e-books, etc.) for individuals with mental health problems.

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Let's start with a small talk! On the importance of different communication functions in modeling language emergence

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One of the main reasons why multi-agent models of emergent communication are an attractive tool for ecologically-oriented language researchers, is that they allow to tie communication with action. More traditional approaches in linguistics and philosophy conceptualize language as a vehicle of thought, which in the first place enables one to exchange information and beliefs with others. Therefore, they focus on assertion as the fundamental type of speech act. The ecological perspective, on the other hand, sees communication as a tool for influencing the behavior of others in order to coordinate and achieve one's goals. As a result, it departs from the descriptive and informative function of communication and turns to the language in use, which to a greater extent consists of acts such as requesting, pointing to something, ordering, expressing emotions and valence or getting someone's attention.

This view is in line with the main motivation behind multi-agent simulations of emergent communication. They derive from recognition of the importance of goal-oriented acting in the emergence of language and aim at modeling social situations in which a population of agents establish some form of communication among themselves out of a need to signal, for instance, warnings (Loula et al. 2010), commands (Mordatch & Abbeel 2018), or directions (Grouchy et al. 2016, Schulz et al. 2012).

However, as I argue in this talk, the modeling effort in this field oversimplifies acting with language, reducing it to the directive

function and neglecting the social nature of coordination. I support this claim with the results gathered from an experimental semiotics study I conducted, based on a selected multi-agent simulation (Mordatch & Abbeel 2018). Building on the insights from comparing the behavior of artificial agents and the human participants, I try to demonstrate that a desirable step towards modeling more flexible and human-like communication goes through the simulation of conditions that would allow for the emergence of a more diverse set of communication functions, going beyond both purely informative and directive functions.

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On understanding through geometrization

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From renaissance masters studying the perspective, through the marriage of geometry and algebra that gave birth to modern mathematics, to the odd geometries of Escher's drawings and curved spacetime of general relativity theory, geometric considerations are at the core of arts and sciences. In both cases geometric thinking offers enabling constraints that impose an abstract, yet intuitively understandable, structure on seemingly intractable problems, often revealing their natural solutions. Interestingly enough,

such a perspective has been largely absent from social, cognitive and behavioral sciences. One can argue that this is problematic since all sciences concerned with complex systems are inevitably relational, and geometry can be seen as a theory of structured relations.

In this talk I invite the audience on a brief excursion through my personal reflections on the art of building scientific theories in general and the role of geometry in this process in particular. The main ideas will be illustrated with problems from network science – a fundamentally relational endeavor – and along the way I will sketch an outline of a framework for building scientific theories which links basic observables to more and more abstract and non-tangible concepts through an exploration of their geometric meaning. In particular, we will focus on the geometric meaning of notions such as similarity, complementarity and hierarchy.

It is hoped that the proposed framework may prove to be useful, or at least inspiring, not only for scientist, but also artists, as it seems that, at least in some limited sense, it shares a lot of commonalities with the artistic process, which often starts from a simple, intuitive and tangible concept or object and explores its more and more unobvious transformations, interpretations and reconfigurations.

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