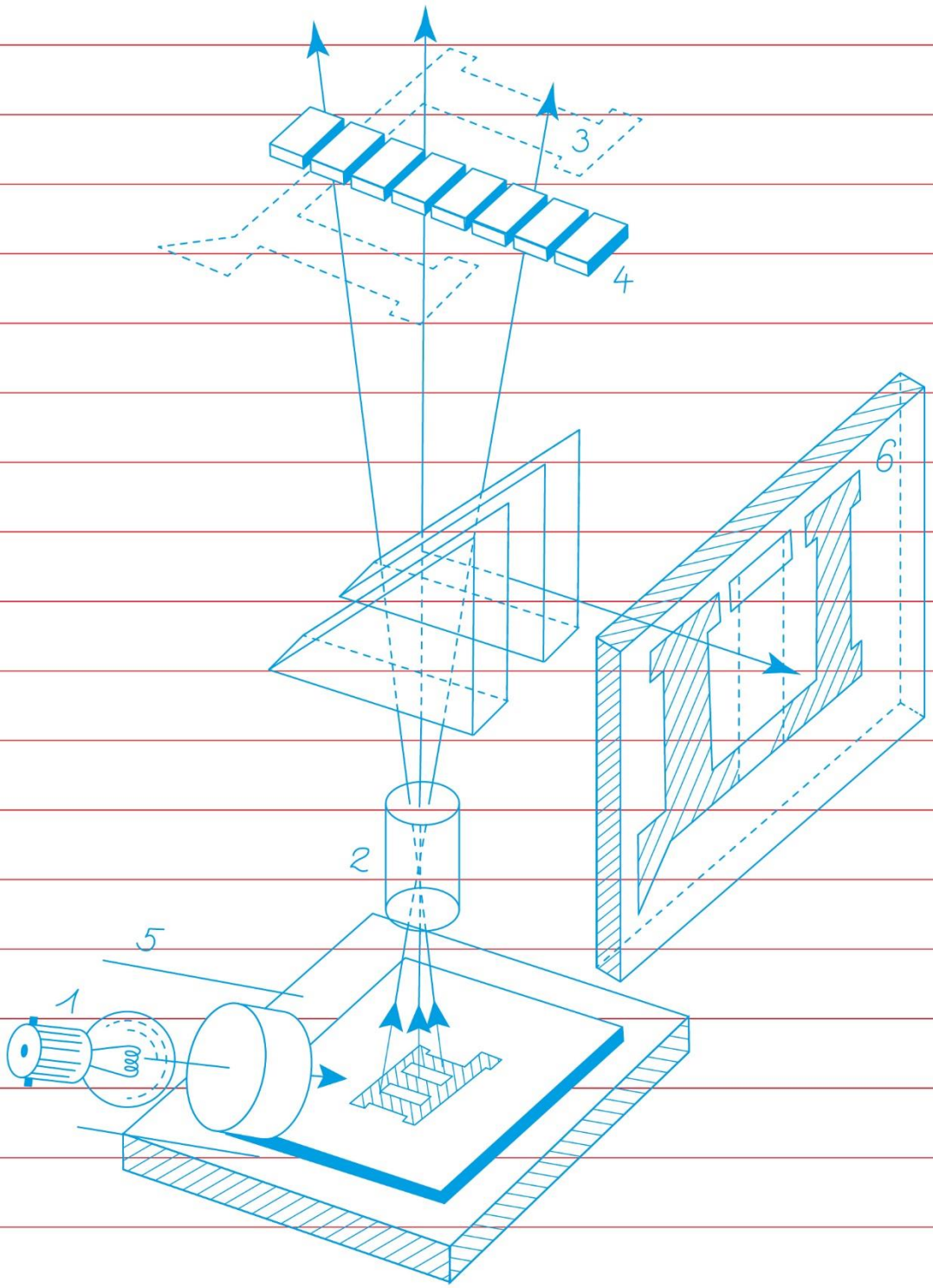
Technology and Language



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Scientific Language – A Comparative Analysis of English, German and Russian

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Abstract
This essay for the inaugural issue of *Technology and Language* considers the development of scientific language in engineering. This development is influenced mainly by developments in industry and, in general, in society. With the help of some examples it is discussed how precise are English, German and Russian with respect to some expressions in the field of mechanics and engineering in general. The author is not a linguist and the given conclusions are personal impressions and not based in science. On the other hand, maybe the presented examples stimulate further research concerning the development and accuracy of scientific terms. The focus here is on three languages: English, German, and Russian. Surely, however, there are more examples, also with respect to other languages.

Keywords: Scientific language; Engineering; Mechanics; English; German; Russian

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* рассматривается развитие научного языка в инженерии. На это развитие в основном влияют изменения в промышленности и, в целом, в обществе. С помощью некоторых примеров обсуждается, насколько точны английский, немецкий и русский языки по отношению к некоторым выражениям в области механики и инженерии в целом. Автор не является лингвистом, и данные выводы являются личными впечатлениями и не основаны на научных данных. С другой стороны, представленные примеры, возможно, послужат стимулом для дальнейших исследований, касающихся точности научных терминов. Основное внимание здесь уделяется трем языкам: английскому, немецкому и русскому. Конечно, есть и другие примеры, в том числе и в отношении не представленных в работе языков.

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Scientific Language – A Comparative Analysis of English, German and Russian

INTRODUCTION

The development of the technical language is significantly influenced by industrial development, but also by other factors. This can be shown by various examples from different branches for each language. The present author spent his scientific life mainly with three languages: English, German, and Russian. He was born in Germany that means German is his native language. He was a student from 1974 up to 1980 at the Leningrad Polytechnic (now Peter the Great St. Petersburg Polytechnic University) and during this period fully educated in Russian only and in that time knowing only Russian technical and scientific language. Coming back to Germany it was necessary to improve his German. He started a second professional carrier as a translator. After 1990, the scientific language of what used to be East Germany (GDR) also became English. Now a professor of mechanical engineering, he was from this time on interested in the different possibilities to express similar statements in these three languages, considering that English is the language of the majority of scientific papers, monographs, etc. However, this fact does not mean that English is more precise. In addition, from his student's time it was obvious that the German language had a great influence before World War II. For example, several of his elder academic teachers spoke German fluently. Finally, yet importantly, comparing English, German, and Russian one can state that Russian has far more words.

EXAMPLE 1: SHIPS AND SHIPBUILDING

The author was surprised and deeply impressed when he completed his Russian language studies that there are so many German or German sounding words in Russian. Later he understood the historical background. When Peter the Great was young and the Russian Empire was a not very developed country, the tsar travelled through different parts of the Russian Empire. He understood that for the further development of the country it was necessary among other things to organize the Russian Navy and to gain more maritime outlets. Regarding the first item, the need for shipbuilding was obvious. However, the knowledge on this topic in Russia was very poor. So Peter the Great traveled "incognito" to Western Europe on an 18-month journey with a large Russian delegation ("Grand Embassy"). The tour was connected with visits to Riga, Königsberg, Brandenburg, the Netherlands, England, Austria, Venice, and the Pope. While visiting the Netherlands, he studied shipbuilding in Zaandam and Amsterdam. His visit to German speaking parts of Europe and the Netherlands had a great influence on the Russian language. In this sense, we have now the Russian word "верфь" from the original Dutch word "werf" and most of the elements of sailing ships have Russian names based on the Dutch ones ("мачта" – mast, "рей" – ra, etc.). This example shows how great can be the influence from other languages on the development of a society.

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EXAMPLE 2: MECHANICS

For a long time, mechanics was a field of application for mathematicians. For example, the differential or integral calculus had a great influence on modeling and simulation of mechanical problems. Considering this, it is not surprising that several mathematicians contributed a lot to mechanics. So, for instance, Claude Louis Marie Henri Navier (1785-1836), who was a mathematician and an engineer, formulated the general theory of elasticity in a mathematically usable form (1821). The basics of mathematics are equations; there was no great influence on the language. Only some examples show that some terms from one language are used in another language as well: "ansatz" (German "Ansatz") is used also in English scientific papers and books, the German "Eigenwert" is translated to English as "eigenvalue," which is a mixture of German and English.

EXAMPLE 3: UNPRECISE TERMS IN MECHANICS

The basic terms in mechanics can be expressed in any language without difficulties. However, how precise are these terms in English, German or Russian? The English word "strain" is in German "Dehnung" and in Russian "удлинение." As mentioned in Truesdell (1975) the translation of "strain" into Russian was connected with some difficulties. The editors of the translation (both were professors of the Leningrad Polytechnic Institute/Peter the Great St. Petersburg Polytechnic University) underlined in their foreword that there were some difficulties with the terminology. As an example, they mentioned that Truesdell used two terms "deformation" and "strain," the last one in the descriptive meaning. The Russian translation for both was "деформация," but in the case of the exact meaning "мера деформации" (in English "strain measure") was used. To add to the confusion, the German expressions are "Deformation" or "Verformung" or "Verzerrung" and "Deformationsmaß" or "Verzerrungsmaß." It is obvious that in this case any translator must have not only knowledge of the language, but also a deep understanding of the mechanics of continua. Note that there is another story with respect to the translation of the book by Truesdell: the Russian translation was published in 1975, but the original English book (Truesdell, 1977) in 1977 only.

EXAMPLE 4: MORE GENERAL TERMS IN MECHANICS

The next example is again from mechanics. Among the principles in mechanics we have the "Prinzip der virtuellen Verrückungen." The English translation is "principle of virtual displacements" and the Russian "Принцип виртуальных перемещений". If we are now looking for translations back to German, we get "Prinzip der virtuellen Verschiebung." The problem is the meaning of the old German term "Verrückung": in the strict sense, we have the change of placement by displacement; nevertheless, in German this can be extended to rotations.

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EXAMPLE 5: ON THE USE OF ENGLISH

Probably, English is the most used scientific language. If we are looking at some scientific branches, for example, informatics and computer sciences, we are using the English expressions also in German and in Russian. The English word “display” for the computer monitor is in German also “Display” (only with a Capital letter) and in Russian “дисплей” (same word, but Cyrillic transliteration). In the past there were other words in German or Russian, but people are using mostly the original English term. This is allowed and everybody understands the meaning, and maybe the communication is easier. However, we should be careful with the use of foreign terms in other languages. Similar to the so-called false friends, mistakes are possible: in German we like to use “Handy” for cellular phones. In Great Britain or USA the meaning “handy” is different, and they use “mobile” (GB) and “cellphone” (USA).

CONCLUDING REMARKS

Sometime the development of the scientific languages is influenced by the political situation. Let’s have a look at Timoshenko (1963, 1968, 1993, 2006). His Russian autobiography was first published in Paris in 1963. He had emigrated in 1919 and was the reason for some conflicts with the Soviet Union. In the book he presents very well the influence of German engineering education on Russia and later on the USA. The most remarkable element of this educational system was the combination of theoretical studies combined with lab elements. When he first came to Germany, he studied the experiences of such type of education and reorganized the Russian engineering education. He established by himself a testing machine for the strength of materials lab at the St. Petersburg Polytechnic which was used up to the 1970s when the author visited the lab. However, the strong impact on the educational system had no such influence on the scientific language as it did in the time of Peter the Great. The reason is not known – maybe the Russian engineering language was already well established, maybe there were political reasons (with the beginning of World War I, German was no longer accepted in the Russian Empire and St. Petersburg was renamed, as indeed during the Soviet time all foreign languages did not have a high reputation).

Holm Altenbach

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Multilingualism in the Age of Technology

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Abstract
This essay for the inaugural issue of *Technology and Language* builds on the observation that both humans and animals have a communication system but only humans are multilingual. Likewise, humans and animals use tools but only humans develop technology. The multilingual and technological conditions of humankind are undergoing profound transformations in the age of globalization and under pressure of a pandemic. Since these transformations implicate human languages and technologies in tandem, it is important to study them in tandem as well.

Keywords: Multilingualism; Dominant language constellation; Multimodality; Technology; Communication

Аннотация
Это эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* основывается на том, что и люди, и животные пользуются коммуникативными системами, но только люди многоязычны. Аналогичным образом, как люди, так и животные используют инструменты, но только люди разрабатывают технологии. Многоязычные и технологические условия жизни человечества претерпевают глубокие преобразования в эпоху глобализации, а также под давлением пандемии. Поскольку эти преобразования в двух значительных областях человеческой жизни взаимообусловлены, изучать их нужно тоже во взаимодействии.

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Multilingualism in the Age of Technology

An ant who can speak
French, Javanese and Greek
Doesn't exist.
Why ever not?

(Robert Desnos)

With this short poem Jean Aitchison (2008) begins her discussion of whether *language* is restricted to humans (p. 24). Researchers discovered that mammals, birds and insects possess highly diverse systems of communication, ranging from rather simple to truly sophisticated ones. The wide variety of means by which animals communicate goes beyond sounds, gestures, moves, and chemicals responsible for color change. They include smells, vibrations, tactile displays and light. The aims and functions of animal communication also vary. Honeybees perform their dances to tell others about the location of rich stores of honey; eels release electrical pulses in different patterns and rates in order to communicate their location and territory. Wolves compete for food using facial expressions, staring into the eyes of the competitor, and baring their teeth; they mark their territory by urinating on its boundary. Octopi change colors to reveal anger and readiness to mate, while fiddler crabs wave their claws in a specific pattern.

Scientists describe non-human systems of communication as 'animal communication' rather than 'animal language.' This is not to show that human language is superior to that of animals, but rather to describe the interaction between animals as fundamentally different from human language in its underlying principles: animals engage the first signal system, which connects the communication only with the 'here and now' (Pavlov, 1934) in their mostly seasonal communication that normally corresponds with particular behaviors.

Consider the human faculty for language. The majority of the world's population is bi- and multilingual. It is therefore also sensible to maintain that using *more than one communicative system* is humans' exclusive characteristic. The case of the "speaking elephant" Batyr (1969–1993) who lived in the Karaganda Zoo in the Republic of Kazakhstan in the former USSR, is curious enough, but also controversial and cannot persuade scientists of animal bi-or multilingualism. This elephant attracted attention in 1979 because he allegedly used about twenty words, both in Kazakh and in Russian. Reportedly, having put the trunk in his mouth, pressing the tip of his trunk with the bottom of his jaw and manipulating his tongue, the elephant produced words such as 'Баты́р' – Batyr; 'Баты́р хоро́ший' – Good Batyr; 'Дурак' – the fool; 'Ой-ё-ёй' – Oh-yo – (it is very sonorous – the trunk in the mouth); 'Ба́-ба' – short for 'babushka' – the grandmother; short children's sound 'ba' (the trunk in the mouth). It is difficult to claim that Batyr used

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the two codes as human bilinguals would do, or even distinguished between the languages.

Similarly, while humanity lives in the technological age, we cannot claim that any of the animal communicative systems are supported by technology. The reactions of animals to the communicative situations shown to them by digital means on the screen of various appliances are still organized by people, not apes or clever birds.

We may thus infer that using more than one communicative system on a daily basis is the prerogative of humans. And that although animals are known to use tools, these are quite basic and cannot be compared with human technology. In other words, while sharing the existence of important traits (technology and language broadly understood) with other species on an elementary level (basic limited communication and tools), humans significantly develop these features further, to greater complexity and emergent novel qualities.

Both the technological and language development of the human species undergo crucial transformations in the time of globalization. Both features have developed unique forms that fit our contemporary world.

Multilingualism has a bearing on all of us and in myriad ways. Not only the bi- and multilingual majority of the world's inhabitants, but also those who normally use only one language are significantly impacted by the multilingual world they live in. With that, not everyone realizes the specific nature and scope of multilingualism in the contemporary world.

What is multilingualism? If you ask a passerby in the street what multilingualism is, chances are that you will receive an answer that it is 'about language' or something like multiculturalism. This answer cannot be assessed as totally unsuitable, but it is not correct either. Language and its structures are studied by linguistics. While linguists concern themselves with morphology, syntax, phonetics, semantics and pragmatics, the main interest of multilingualism is *how people use multiple languages* both individually and in groups. Researchers of multilingualism aim to solve the problems and challenges that are associated with multiple languages and that arise in society, education, business, and industry. The purview of multilingualism is indeed broad. Multiculturalism is only one of its societal aspects.

The key feature of the current global language condition is that human language faculty is no longer expressed in the mastery of single languages, no matter how “big” they may be, such as English, Mandarin or Spanish. In today’s globalized world a single named language cannot account for the multitude of communication practices in business, education or any other area of human life any more. In most parts of the world one language does not suffice for carrying out all the tasks and covering communicative needs of individuals and groupings. The language functions that used to be carried out by a single language are now distributed between a number of languages. With that, people do not use their entire *language repertoire* that is, all the language skills in all language varieties that a person can have. This is simply not plausible. Instead, individuals and communities employ the most active part of their language repertoire, a *set of* most

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expedient *languages*, which work together as a unit and enable an individual to meet all their needs in a multilingual environment. Therefore, the contemporary linguistic “unit of circulation" is a *Dominant Language Constellation* (DLC) (see, e.g., Aronin, 2016, 2019; Lo Bianco & Aronin, 2020).

Attempting to untangle multiple interlocking factors, researchers in the fields of education, communication, healthcare, social work, science, economics and engineering deal with the questions that aim to clarify the effects of current multilingualism on individual language speakers, family members, citizens and professionals.

Among these questions are:

Why does it happen too often that grandchildren and grandparents do not understand each other because they speak different languages? Is it right to allocate funds for preparing and grading driving license tests in languages other than English in the United States? Why are people concerned with language loss and how long it takes to revive a language Are there more and less economically beneficial languages? What is an optimal age to start teaching English as a third language to a child who also speaks Catalan and Spanish? Which kinds of schools – monolingual, bilingual or multilingual are appropriate in present-day Vienna? What should be the criteria of selecting working languages for international meetings? Why do not all the people reach the high proficiency in multiple languages as that ascribed to the legendary Cardinal Mezzofanti?

Consider now another crucial global process that develops alongside multilingualism and that is its counterpart – *technology*. The two are inseparable, although we do not always see all the intricate interfaces of multilingualism and technology. In the same way as we need to understand the novel nature of human language, awareness of the role of technology also needs mediation. Contemporary thinkers in philosophy of technology remind us that "[I]ndividual habits, perceptions, concepts of self, ideas of space and time, social relationships, and moral and political boundaries have all been powerfully restructured in the course of modern technological development" (Winner, 1986, p. 9). Nordmann emphasizes that today technology leads us to "questions about ourselves and especially to reflections on how we want to use technology for organizing our way of living together and our relation to the world" (Nordmann, 2015, p. 19).

The tight interconnection between multilingualism in its contemporary form and technology is one more novel development of globalization. The fact that the two primary features of our global human existence are becoming increasingly intertwined raises new questions, and calls for solutions that would have been unthinkable only a little while ago. Increasingly we face the questions that acknowledge the complex and variegated interconnections of contemporary multilingualism and technology. Among them are the following:

Do some Dominant Language Constellations include the so-called languages of technology, such as Languages of Mechanics used in mechanical engineering that draw on a long tradition of considering the compositional practices of builders and makers as a language of sorts, and do they associate the very term “technology” with a grammar of things? Do only digital methods of communication and teaching additional languages

meet the various goals of discourse and language acquisition? Which languages are better served by digital facilities? Should small dying languages be supported via computer projects and programs? Is using Roman script while writing messages in languages like Arabic, Chinese or Russian a positive or a negative development? Where will the change of script prompted by technology lead us? What will happen with languages and, importantly, their users, as a result of the current trend accelerated by the COVID-19 pandemic to move communication and learning online, resting on the shoulders of technology? Will the LOTE – languages other than English – flourish or whither in the current uncertain reality and how will the latter change the existing hierarchies of languages and the corresponding status of their users?

It appears so far that the technologically supported real life interactions between individuals and organizations and governmental systems roughly mirror the interactions and hierarchies of the off-line world. Will this change as a result of the COVID crisis in the near or distant future?

These complex interconnections are partly covered by the concept of *multimodality* of multilingualism. Not only in the number and variety of modalities but more importantly, in the ways these modalities are distributed through tasks and languages, modified by social rules and individual emotions.

Multimodality of multilingualism is only one way of interconnection of multilingualism and technology. An exciting path awaits researchers, a road full of new insights into multilingualism and technology to be explored as those mature and expand in tandem.

Larissa Aronin

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Connecting the World and the Word
The Hard and the Soft in Michel Serres's Philosophy

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Abstract
This essay for the inaugural issue of *Technology and Language* builds on work in the philosophy of chemistry and materials science. Like these sciences, it begins in the middle of things and explores the condition of the mixt which precedes the scientific interest in purification. – The essay discusses the difference between the hard and the soft in the writings of Michel Serres. In the real world, there is nothing like hard, brute matter on one side, and soft information, codes, on the other. Not only the body is a system producing language out of noise and information, but everything in the world, whether natural or artificial, is emitting information. We live in an intricate mixt of hard and soft.

Keywords: Michel Serres; Technics and technology; Material cost of symbolic code; Entropic and informational technology; the Mixt

Аннотация
Данное эссе для первого выпуска журнала *"Технологии в инфосфере" ("Technology and Language")* основана на исследовательской работе по философии химии и материаловедения. Как и эти науки, оно начинается с исследования "смеси", предшествующего научному интересу к выявлению чистого вещества. В статье обсуждается разница между "твердым" и "мягким" в произведениях Мишеля Серра. В реальном мире нет четкой грани между инертной твердой материей и информационными кодами. Не только тело – это система, производящая язык из шума и информации, но и все в мире, неважно естественное или искусственное, излучает информацию. Мы живем в сложной смеси твердого и мягкого.

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Connecting the World and the Word
The Hard and the Soft in Michel Serres's philosophy

The distinction between hard and soft runs through Michel Serres's works and depending on the context of argumentation it refers to many different things. Hence a mesh of interwoven meanings.

Initially introduced as a mere transposition of hard science (natural science) and soft sciences (humanities and social science), it referred to the physical as opposed to the domain of signs and language.

> Breaking rocks, transporting them by the tonne, compacting their sharp edges into a solid mass, demands an energy output measurable in horsepower. On the other hand, drawing letters and crosses with a brush, red on white, recognizing their place within a code, makes energy demands that are not even comparable. The former is measured on the entropic scale, the latter on the informational scale. The former is manual, the latter digital. (Serres, 2008, p. 112)

This contrast is by no means a dualism between nature and culture. Quite the contrary. Serres's major claim is that the hard and the soft do not refer to ontological realms but to two scales of 'energy budget', the difference of magnitude between the entropic and the informational. Relying on Norbert Wiener and Claude Shannon's information theory, he assumed that linguistic work like mechanical work is a struggle against disorder. This tendency toward disorder is named entropy at the scale of thermodynamic machines and noise at the scale of codes and signs. Order is produced out of disorder, information out of noise. Whatever their difference, the two fields are both concerned with energy transfers in a system. Information, whether emitted, transmitted or received, is negentropy ('Origin of language' in Serres, 1992, p. 261). There is no ontological difference between the material world and the immaterial codes and signs but a difference of intensity between the hard and the soft. As they refer to two domains in a continuum, they are commensurable, interchangeable in spite of a huge gap of 10^{16} zeros between them.

In his book *Les cinq sens (The Five Senses. Variations on the Body)*, Serres presents the sensuous body as a blackbox softening the world, a converter of hard into soft. Hard sensory data enter in the box through perception and the output is information and meaning. «Sensation, never pure, filters energies, protects itself and us from excess of it, encodes and passes information : it transforms hard into soft» (Serres, 2008, p. 115).

In his later career, Serres modulated the couple hard/soft in an evolutionary perspective and became more fascinated by the power of the soft and the social-cultural impacts of the digital age. In *Hominescence* (2001) he advocated what he dubbed an «exoDarwinian view» of technology, assuming that all tools, from hammer to computer, are projections of human organs in the outside hard world. He described the evolution of technology as a softening process through three major "revolutions": the invention of

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scripture (externalization of memory), the invention of printing machines (second step), and the invention of computers (externalization of brain capacities). To better convey the increasing importance of information in the history of technology, he reformulated the distinction between “techniques” and “technology” in French. “Technique”, he claimed, refers to machines operating at the entropic scale, like the steam engine whereas “technology” (combining technique and logos) refers to machines for exchanging information (Serres, 2001, p. 207). While techniques directly transform the world, the soft machines of the digital age reconfigure the world by changing our way of occupying space and time.

However far from advocating that the soft overtook and eclipsed the hard, Serres insisted on their intricate combinations. In the real world, there is nothing like inert, brute matter on one side, and information, codes, on the other. We live in an intricate mixt of hard and soft. In other words the increasing importance of information does not convey human exceptionalism. Scripture and memory are not the privilege of humans. The material world is full of traces and inscriptions that are memory of past events on the Earth. The living world is shaped by the circulation of the genetic code and our genome is the memory of the biological evolution.

> But, once again, *who* has memory? Tradition replies: humans, in their cognition, their mnemonic faculty, their traces, written, engraved or drawn, those they decipher. No, for things themselves memorise, by themselves and directly. The past is inscribed in them, it is enough to decipher it from them... Hard things display a soft side; material of course they engram and program themselves like software (*logiciel*). There is software in the hardware (*materiel*). (Serres, 2003, p. 70, p. 73)

Serres claimed that he was above all interested in what happens between the hard and the soft, He insisted on the information buried in the material world, and symmetrically on the hard violence sometimes hidden in language. Words can kill as much as weapons. He could even more directly have pointed at the material cost of computers and internet connections which consume energy at the entropic scale while depleting material resources. Serres so much insisted on the ubiquitous presence of the couple hardware-software that one can say that his entire career has been dedicated to Hermes the Greek god of communication who inspired the titles of five of his early books.

As Serres broke with the structuralist movement in the 1980s, he blamed philosophers for their addiction to language, to the soft, and claimed to turn his attention to the real world, the world of living bodies and machines operating in the industrial world. However while making his “thing turn,” Serres never gave up the domain of language, in the broad sense of a code of signs. In his view, not only the body is a system producing language out of noise and information, but everything in the world, whether natural or artificial, is emitting information. And as a philosopher Serres tried to restore speech to the things, to listen to the world.

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The Language of Human-Machine Communication

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Abstract
This essay for the inaugural issue of *Technology and Language* discusses the problem of finding an optimal form of human-machine communication. In the ongoing search for an alien mind, humanity seems to find it not in the infinities of space, but in its own environment. Changes in the language of human-machine interaction made it understandable not only to trained specialists but to every household. In the course of time, home appliances and devices have developed their language abilities even more and reached a very advanced level – by way of status indicators, displays, emergency sound and color signals. The transition to computer-assisted communication brought about a great diversity of human expression forms translated into the discrete digital language of technologies. According to some prognoses, the first human-robot marriage might be registered in the future, however, such a union is not the only possible human-machine alliance.

Keywords: Technology; Language; Communication; Robot

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* обсуждается проблема поиска оптимальной формы человеко-машинного общения. В непрекращающемся поиске чуждого разума человечество, кажется, находит его не в бесконечности космоса, а в своей собственной среде. Изменения в языке взаимодействия человека с машиной сделали его понятным не только для подготовленных специалистов, но для любого человека. С течением времени языковые способности бытовых приборов и устройств достигли очень высокого уровня – они могут изъясняться с помощью индикаторов состояния, дисплеев, аварийных звуковых и цветовых сигналов. Переход к коммуникации при помощи компьютеров привел к переводу огромного многообразия форм самовыражения людей на дискретный цифровой язык технологий. По некоторым прогнозам, в будущем может быть зарегистрирован первый брак человека и робота, при этом такое объединение – не единственно возможный союз человека и машины.

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The Language of Human-Machine Communication

Language is a system that enables us to understand the intention of others, hence we may speak about "the language of technologies." Technologies implement the intention and actualize it, thus making our intentions understandable. In the course of time, human-machine interaction has become more complicated and there are indications of it growing into an ever more symbiotic relationship. Technologies are turning out to be the counterpart that helps humankind find its identity.

In this regard, it is noteworthy that scientists have been considering the language of mathematics and physics to be the most appropriate language for interaction with extraterrestrials. Florence Raulin-Cerceau (2010) gave many examples of human-extraterrestrial interaction: German mathematician and astronomer Karl Friedrich Gauß, for instance, proposed to draw a giant triangle and three squares on the Siberian tundra as an illustration of the Pythagorean theorem, while Austrian astronomer Joseph Johann von Littrow came up with the idea to draw giant geometric shapes in the Sahara. Konstantin Tsiolkovsky, a Russian pioneer of cosmonautic theory, proposed to send a mathematic message using flashing shields, "To do this, the shields are forced to flash once, then 2, 3 times, etc., leaving a gap of 10 seconds between each group of flashes. In that way we could show our full arithmetical knowledge which is to show, for example, that we can multiply, divide, extract roots and so on. Different curves could be depicted by a row of numbers with a parabola being 1, 4, 9, 16, 25 next to each other..." (Tsiolkovsky, 1896). Finnish mathematician Edward Engelbert Neovius proposed to send messages ranging from simple arithmetical concepts to sophisticated logic and physics of the Solar System, using light pulses. Nikola Tesla (1901), a physicist and inventor in electrical engineering, wrote, "Absolute certitude as to the receipt and interchange of messages would be reached as soon as we could respond with the number 'four' in reply to the signal 'one, two, three'."

When humankind seeks to communicate with an alien nature in order to better understand itself, the alien does not have to be a creature from outer space. The machine, our technology, is also an alien to us with which we initially communicated using a formal language, and now we are conversing it in natural language.

At an early stage, it was only highly qualified engineers who could understand the language of technologies and were able to decipher feedback.

As time goes by, this language is becoming simpler. Now, special training is no longer required to communicate with simple devices – reading the user's manual is enough. Devices become part of the family as soon as they enter the household.

The 20th century saw the emergence of a new language for humans and machines which was alluringly simple. The slogan "Just press the button" marked a new period in the development of the language as anyone could easily transmit their intention by pushing the right combination of buttons.

The ability of a device to respond became the next level of interaction. The response was transmitted in different ways ranging from a simple indicator light to a screen with detailed information: The battery is low, the filter is clogged, a container needs to be emptied, something is broken. Moreover, devices started to initiate the communication.

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When something goes wrong they switch an alarm to draw human attention: A door is open, access is unauthorised, the water-level is low.

The transition to computer-assisted communication led to a greater diversity of human forms of expression that were translated into discrete digital language of technologies. The Internet turned out to be a mediator able to support meaningful human-machine interactions. The Turing test allowed people to check the acquisition of a natural human language by a machine. Created in 1972, the robot PARRY successfully passed the test of modeling the behavior of a paranoid schizophrenic (only 48% of participants could tell the difference between PARRY and a human conversation partner) (Paliwal et al., 2020).

Machines speak more and more like humans and the amount of time that evaluators spend to recognize artificial intelligence during the Loebner Prize competition increased from only 5 minutes in 2003 to 25 in 2010. Our technological counterpart resembles us so much that the question about what a person should say to prove that they are human is still open. During an interesting experiment (McCoy & Ullman, 2018) people who were asked to say a word to convince others that they are human tended to choose “love”, “compassion”, “human”, and “please.” When they assumed the role of judges who determine who is human and who is not, they assigned the word “poop” to the human. This seems to demonstrate that machines are more expected to respect social rules of behavior than people. A way to prove humanness is presented in a short story by Robert Silverberg (1966) where absurd and illogical replies to substantive questions prove to be successful.

The notion of “The Internet of Things” that describes the network of gadgets which are able to communicate with each other and with human beings, does not reflect a new concept of a thing. Something that understands voice commands, sends multimedia messages to your smartphone, makes a map of the house while vacuuming, and reminds the owner to remove a slipper lying on the floor, can hardly be called a thing.

Although the term “The Internet of Things” does not define the status of the new interlocutors of humans, at least it underlines the inadequacy of referring to them as things. It can be assumed that for a human psychology the possibility of adequate communication is a criterion for defining a human. As in the case of human-to-human communication, anyone who knows the language has advantages. The widely discussed problem that a smart device can obey anyone besides the owner is intrinsically linguistic (Hoy, 2018; Mitrevski, 2018). An intruder may say a few words in its language and make it open the door or pass sensitive information.

The linguistic breakthrough of enabling gadgets to converse in a natural human language and to maintain oral communication resulted in a stronger emotional response from their owners. Even though a deaf-mute device sometimes made us want to scold it for its misbehavior and irresponsiveness, its ability to speak like a human changed its status all the more. People tend to personify gadgets giving them names and referring to them using personal pronouns – see, for instance, Amazon customer reviews (Purington et al., 2017, p. 2858). Maja Mataric (2007), an American computer scientist and roboticist, says the following about vacuum cleaner robots: “Roomba users already refuse to have their Roombas replaced when they need to be repaired, insisting on getting them back. What will happen when the robot becomes much more interesting, intelligent, and engaging than the Roomba?” (pp. 285-286).

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The less technically experienced a person is, the more they tend to see their own reflection in the counterpart, attributing their own feelings and emotions to it.

A woman describes her interaction with a virtual assistant in the following way: “There was one time I was very [sarcastic] to it, I was like ‘oh thanks that’s really helpful’ and it just said, I swear, in an equally sarcastic tone ‘that’s fine it’s my pleasure’” (Luger & Sellen, 2016).

Children’s communication with a virtual person assistant is of particular interest. Asking questions about its personality and life, they believe that robots are social beings and they like them accordingly (Kahn et al., 2012, 2013). Children’s belief that devices that talk to them are alive is an alternative to their belief in Santa Claus, who does not meet the expectations of a sophisticated audience (Waller, 1991). The Christmas character will be allowed to stay, though, if he replaces magic with cutting-edge technologies and uses 'ion screen' (Westin & Skjetne, 2016), delivery drones and hyperloops. In the meantime it might transmit high-frequency sound waves to specific regions of the brain to control naughty behavior and to send information to an exabyte-capable data storage facility (Chang, 2013).

Robot development resulted in the creation not only of industrial and service robots but also of companions, carers, pets, and sex robots which entail emotional relationship including affection and love. According to some prognosis, the first human-robot marriage is only a matter of time 2050 (Levy, 2017). Although it is not yet recognized by authorities, the precedents for such unions already exist. In 2017, a Chinese engineer married a robot he created in the presence of his mother and friends during a traditional wedding ceremony (Huang, 2017). Such a union, which is regarded as supremely intimate when it comes to human relationships, is not the closest human-machine alliance that is possible, and similarly, the ability of a machine to speak human languages is not the ultimate technical achievement. Gadgets can now respond not only to human words, but also to gestures, eye movements, blinking. Today, a brain-machine interface, where signals from brain neurons directly control robotic prostheses, exoskeletons, etc., is already in use. Thanks to neural prosthetics, technology can become an intimate part of a person.

Technologies and humanity have come a long way to find a common language. It’s not just that, for instance, users of virtual assistants change their way of speaking, “quickly learning to phrase their requests very carefully, often specifying them as a precaution” (Seymour & Kleek, 2020). Humans have been able to translate most of their life into a discrete digital code of ones and zeros, perfectly accessible to the machine, which in turn has “learned” the natural human language and is already becoming able to understand brain signals. The level of understanding of the intentions of the machine has grown enormously. Interaction with this alien interlocutor can contribute to the comprehension of humanity itself.

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When Machines Talk: A Brief Analysis of Some Relations between Technology and Language

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Abstract
This essay for the inaugural issue of *Technology and Language* builds on sustained discussions of the relation of the (philosophy of) technology and the (philosophy of) language, for example in the suggestion that there are „technology games“ in analogy to „language games“ as forms of life. In light of recent technological developments, this essay takes another step by way of distinguishing three types of interaction between language and technology as one considers technology as a language author, language user, and shaper of a form of life. This reflects back on what technology itself is and does. Technology is deeply integrated in, and interwoven with, our human world and our human thinking, which is always also a world permeated with, and enabled by, language.

Keywords: Technological authorship; Artificial intelligence; Wittgenstein; Language games and technology games

Аннотация
Данное эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* построено на обсуждении взаимосвязи (философии) технологии и (философии) языка. Например, автор высказывает предположение, что в мире существуют *“*технологические игры*”* по аналогии с “языковыми играми”. В свете последних технологических достижений данное эссе делает еще один шаг к различению трех типов взаимодействия языка и технологии: технология как автор языка, как пользователь языка и как творец мира. Это возвращает нас к вопросу, что такое технология и что она делает. Технологии глубоко интегрированы и переплетены с нашим миром и нашим мышлением, которые в своею очередь также имеют тесную взаимосвязь, основанную на языке.

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When Machines Talk: A Brief Analysis of Some Relations between Technology and Language

INTRODUCTION

Much can be said about technology and language, which is a fascinating field on its own that has received far too little attention in contemporary philosophy of technology. Some of the landscape I have mapped in previous work (Coeckelbergh, 2017a, 2017c). In this brief contribution, I will distinguish between three ways in which language and technology relate. These relations also reflect back on what technology itself is and does. Moreover, in the light of recent developments in digital technology, in particular artificial intelligence, robotics, and natural language processing, I will highlight the ways in which such technologies take a more active linguistic and semantic role and "talk" in various ways.

LANGUAGE IN TECHNOLOGY: WHEN TECHNOLOGY STARTS "AUTHORING"

There is language "in" technology in the sense that technologies, and especially digital technologies, are not only material artefacts – the focus of the so-called 'empirical turn' in philosophy of technology (Achterhuis, 2001) – but also are made of language in various ways. Consider the many programming languages used to create software or text (and hence natural languages) on the internet. Without these artificial and natural languages, there would be no digital technologies and no digital social media.

Moreover, whereas previously digital technologies merely stored and represented linguistic *corpora* created by humans, today, due to developments in artificial intelligence (especially natural language processing through deep learning) they take a more active role and become "author" themselves. Perhaps the best example of technology becoming an "author" is the recently developed language generator GPT-3: a language model that uses deep learning, a form of machine learning, to create human-like text (see for example Gary & Ernest, 2020). While some (including its creator R&D company OpenAI) see this as a step towards general, human-like artificial intelligence, the system does not understand the world and does not know what it is doing. Only humans can make sense of the world. Since the work of Dreyfus (1972), there is a tradition of philosophers showing the limitations of artificial intelligence. It may also be still relatively easy for humans to detect that the text is coming from a machine. Nevertheless, technologies such as this show that digital technology is gaining more agency and autonomy when it comes to authoring text, and we have still to see the resulting applications and evaluate their ethical and societal implications.

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LANGUAGE USED IN TECHNOLOGICAL PRACTICES: WHEN TECHNOLOGY STARTS TALKING

But technology is not only about things or systems; it is also about practices done by humans. Here language also plays a role: humans talk about technology as they use it. To take an example from a philosophy text, Wittgenstein's *Philosophical Investigations*: when builders use slabs, they may ask each other to pass one, saying "Slab!". This use of language relates both to humans and to things. As Austin (1962) put it later, words are not only used to describe things but also to do things and to get others to do things. Words and things are thus both part of a practice, or what Wittgenstein called a 'game.' To use a contemporary example involving digital technology: when people interact with a robot, they may talk about the robot in order to describe it or to get someone else to do something (e.g. shouting "Robot!", meaning "Go out of the way, the robot is there!"). They may also use language to give it a particular status, for example to say that it is a "thing", a "machine", or that it is a "person" – all of which have normative meanings and consequences. As Searle (1995) would say, we use language here in the form of a 'declaration', which gives a particular (social) status to things. But this has social and ethical implications. In a sense, we "construct" what the robot is through language (Coeckelbergh, 2011). For example, it mattes for its status and how we treat it whether we give the robot a personal name or say that it is a "machine". What the robot "is," depends not only on its material, physical appearance, but also on how we talk about it and to it.

Yet the latter example also points to a different relation between language and technology: the robot may come to be seen as more than a machine, as an artificial other. And this is especially likely to happen when robots are not only the object of human talk, but start talking themselves. If developments in AI, especially natural language processing and synthetic speech, continue, a different human-technology relation takes shape. In this relation both humans and non-humans become natural language users, this time not only by means of text but also by means of speech. Again one may point to limitations. For example, one may claim that machines do not have a "voice" like humans, who unlike robots have a voice in a biological and social-political sense. But phenomenologically there is a clear difference: the machine is not only talked about but also talks. This is already the case to some extent for instance with digital home assistants such as Alexa. In the future we may see more devices, including robots, that are linked to artificial intelligence, enabling them to participate in conversations with humans. Again we do not yet know all the applications and implications, but one implication is that such devices and machines now are also able to do things with words and make others (humans, other machines) do things. This includes them in the socio-material practices and games described by Wittgenstein and others.

While postphenomenology (Ihde, 1990) already claimed that things mediate between us and the world, when these things become language users they have further unintended consequences, which are far from clear yet. In previous work (Coeckelbergh, 2017c) I have proposed some ways to map relations between technology, language, and world, in terms of mediation but also in other ways. This includes conceptualizing that and how technology "talks" – in a metaphorical sense of gaining more agency and having unintended consequences, and sometimes in the literal sense of speaking. Moreover, the Wittgensteinian framework enables us to reveal the social and political dimension of what

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technologies and language do. Whereas postphenomenology tends to focus on individual users and their relation to the world, here technology is embedded in wider contexts or what I have called 'con-technologies' (Coeckelbergh, 2018). This brings us to the third way we can conceive of the relation between technology and language.

LANGUAGE IS LIKE TECHNOLOGY, AND TECHNOLOGY IS LIKE LANGUAGE: WHEN NEW TECHNOLOGY SHAPES A NEW FORM OF LIFE

In order to show that the meaning of language is about use, Wittgenstein (1953/2009) relies in the *Philosophical Investigations* on technological metaphors: he compares words to tools. Language then functions as a kind of 'toolbox'. It is an instrument – indeed, it is itself a technology. But as I have argued (Coeckelbergh, 2018), we can turn the metaphor around and say that technology is like language. This enable us to import Wittgensteinian thinking about language use into philosophy of technology, in particular thinking about technology use. The result is a more holistic way of thinking about technology that links technology with the activities and practices it is part of and – using Wittgenstein's terminology – with what I have called 'technology games' (Coeckelbergh, 2018) and forms of life, putting it firmly in a social and cultural environment, which regulates it but also is shaped by it. The point is not only that technology has structure and a kind of 'grammar' (Nordmann, 2002) in the way it is composed materially, but that it this material composition is in turn part of a social and cultural "grammar." In use and as used, technology is part of a larger whole of the way we do things, of a form of life.

Today's digital technologies, then, are not only passively shaped and regulated by the culture in which they flourish – this is certainly also the case, consider for example the salient influence of Californian culture on technology development *and* use – but also, more "actively', define and shape that culture, influencing our creation and communication of meaning. For example, as I have shown romantic thinking and culture, which emerged in the 19th century, still influences our use of, and thinking about, technology (Coeckelbergh, 2017b), but at the same time the new technologies also influence our entire way of thinking. Exactly how is a matter of discussion. For example, one might argue that today's modern technologies like power plants created a culture of treating things and the whole natural world as 'standing reserve' for human purposes (compare Heidegger, 1977). Fitting into this culture, artificial intelligence and data science may lead to datafication or informatization of the world in the sense that we conceive of the world (and in the end ourselves) as a collection of data or information. Some do not think this is necessarily problematic, or believe that it has always been like that in the first place. According to Floridi (2011), the 'infosphere' is the totality of being and we are informational entities. In any case, this example clearly shows how engagement with a technology (here: the internet of the 1990s and its further development during the previous decade) led a philosopher to think differently about the world. Another proposal for how technology shapes our thinking and culture: one could argue that technologies such as artificial intelligence get interwoven with religious meanings.

We expect a lot from technology, especially artificial intelligence. We expect that it solves all our problems (technological solutionism). Is it becoming an oracle or a god? What are the new practices, games, and rituals that will emerge?[1]

Technology shapes our thinking and culture, and not only because we humans create technology but also because, as a game changer and shaper of our form of life, technology is deeply integrated in, and interwoven with, our human world and our human thinking, which is always also a world permeated with, and enabled by, language. The story of humanity is also the story of technology, and both are entangled with the story of language. Thinking about technology and language is therefore crucial: our future depends, quite literally and materially, on the words and things we use. And increasingly also: on the words and things *machines* use.

Mark Coeckelbergh

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[1] Consider for instance the art work "Appropriate Response" (2020) by Mario Klingemann, which creates a ritual-like experience in which a person who kneels looks up to a split flap display that shows a short phrase written by a neural network (GPT-2, the forerunner of GPT-3 mentioned elsewhere in this article), which seems to be meant as a kind of inspiration or guidance : https://onkaos.com/mario-klingemann/ The installation raises questions about authorship (doubt whether this is written by humans or by a machine), but also about between technology and religion.

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Technology and Language Технологии в инфосфере
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Language of Art as Language of Utopia

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Abstract
This essay for the inaugural issue of *Technology and Language* looks at language and technology coming together in avant-garde art, Russian futurism and constructivism. When words become a visual elements in the composition of new worlds, the creation of words can be seen as a way of breaking with the thinking of the past, but it can also be viewed as a social technology for the construction of a new life. Artists and poets experimented with graphic and phonetic images of the words. Though constructive principles and laboratory methods of creation were thought to be universal, the ideas of effectiveness and economy were not accepted unanimously. Viktor Shklovsky, founder of the formal school of philology, did not consider poetic language subject to regulation by principles of economy. Still, the creation of a new language united all the schools of the avant-garde and builders of proletarian culture, which found expression in sound poetry, *zaum, novoyaz*. Conceived between 1910 and 1920, they were a tool for utopian projects and creative development.

Keywords: Avant-garde art; Language creation; Constructivism; Artistic and social utopia; Viktor Shklovsky

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* рассматривается соединение языка и технологий в авангардном искусстве, русском футуризме и конструктивизме. Когда слова становятся зримым элементом в композиции нового мира, создание новых слов можно рассматривать как способ разрыва с мышлением прошлого, а также как социальную технологию для построения новой жизни. Художники и поэты экспериментировали с графическими и фонетическими образами слов. Хотя принципы конструктивизма и лабораторные методы творчества претендовали на универсальность, идеи эффективности и экономии не были приняты единодушно. Виктор Шкловский, основоположник формальной школы в филологии, не считал, что поэтический язык может подчиняться законам экономии. Тем не менее, создание нового языка объединило все школы авангарда и создателей пролетарской культуры, что нашло отражение в звуковой поэзии, зауми, новоязе. Созданные в период 1910-1920-х годов, они стали инструментом для утопических проектов и развития творчества.

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Language of Art as Language of Utopia

The language of modernist art changed the relationship between artist and audience. An understanding of the language of XX century art might be achieved by various approaches. One of them is to draw parallels with the language of the visual arts of the avant-garde with its tendency to single out some prototypical forms that affect a spectator, a tendency which was manifested in an analytic type of creation and in abstraction. The abstract language of art with the disappearance of story-telling and even of subject-matter brought about different types of connections inside the work of art and a changed relationship between spectator and artist, reviving such activities as solving mysteries and finding clues for the coded messages. Fragments of words, ciphers, and letters scattered disorderly in the paintings of futurism demonstrate the dynamics of modern life and the disruption of routine relations and logic connections. They are mixed up with details of landscapes, still-life, and portraits, showing the quick passing of timeand interrupting discrete way of perception. Russian futurists, such as Olga Rozanova, Natalia Goncharova, Mikhail Larionov, drew on the power of the written word to attract attention. In this, they were inspired by handmade street advertising billboards. But still, this use of words do not take us closer to the meaning of the artistic message, so one will have to address an interpreter. Kazimir Malevich wrote in the catalogue of the exhibition "Tram B" about several of his works: "the content of the works is unknown to the author" (Malevich, 2000, p. 14), and thus the art critics of today are still occupied with finding an explanation. In these paintings which the artist himself defined as "illogical realism," fragments of words leave a "semantic shadow" only (Malevich, 2000, p. 17).

Letters, words, and lines exposed their graphic image and phonetic performance. As soon as we pass from the theoretical notion of a language of art to the visual image of words in avant-garde painting, we enter the sphere of an experiment where the "book of an artist" is of special interest since it exhibits characteristic techniques such as the distortion of the typographic, the creation of an equality between words and arbitrary arrangements of letters, the return to expressive handwriting along with a total denial of printing technology and the layout of a page. Letters, words, and lines were to expose their visual qualities. Visual experiments with words were close to the poetic ones, in both cases the understanding of language shifts from semantics to graphics, from phonetics to sound and visual appearance (fig. 1, 2). Poetry melted into drawings and into music. Those experiments were inspired by an idea of the word's liberation from the burden of habitual meanings. But actual revolutionary change was associated with *zaum* which dates back to Alexei Kruchenykh's declaration "The Word as it is" of 1913 where he claimed that “new verbal form creates new content” (Terekhina & Zimenkov, 1999, p. 44). Futurists expressed their conviction that the future could only be depicted with the help of new words that never existed before. *Zaum* appeared in the course of a poetical revolution dedicated to the free creation of words. It

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presupposed new rules of perception, mostly spontaneous and often connected with the performative and musical context or with the visual arts. Velemir Khlebnikov considered the creation of words an instrument for the creation of a new world creation, a new universe. Language for him was the only way to understand the universal principles of nature (Douglas, 1980). The creation of words is opposed to the «petrification of language" (Terekhina & Zimenkov, 1999, p. 66).

Figure 1. An example of zaum "Vzorval'...", litograph by Rozanova (Kruchenykh, 1913, p. 11)

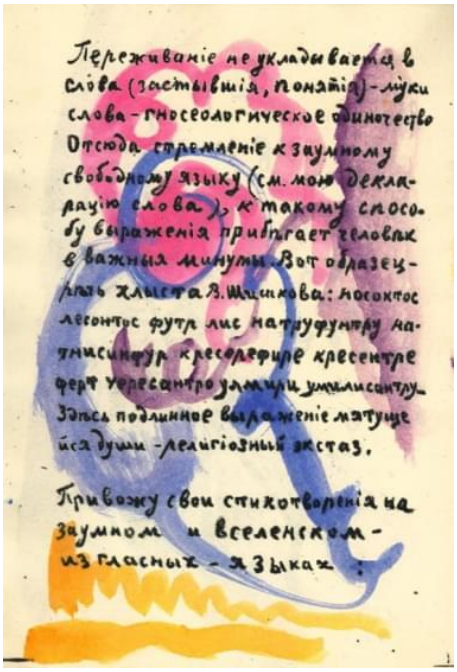

Figure 2. text "Переживание не укладывается в слова...." ("Emotion does not get into words...") by Kruchenykh (1913, p. 23)

Constructive principles could be applied to the creation of a new material world and a new language. The system of a new language (novoyaz) was aimed at defining and recruiting adherents and keeping distance from hostile social elements and from other cultural traditions. Spoken language preserved the features of old culture, so most of it was of no use for the construction of a new life. It had to be changed to distinguish builders of the new world and would thus perform the role of a social technology. The postrevolutionary period was marked by launching a project of proletarian culture (Proletcult). Alexander Bogdanov thought that language could become an important instrument for constructing the new life.

The idea of construction that was generated for the visual arts in the years 1914-1916 soon turned into a creative principle for building the new life. First soviet art-critic Nicholai Punin characterized it as an embodiment of Alexander Bogdanov's organizational principle. Thus, the term constructivism was widely used in many spheres of social science, humanities, and theory of art. The avant-garde and constructivism had already been associated with a new approach, forward-looking and free from the

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stereotypes of tradition. As the organizational form for building the new life, it appropriated social justification. Its logically formed structure made constructivism look like visualized philosophy (Railing, 1995, p. 199). It was also understood as a new type of thinking which is naturally relevant in science and technology but should also be applied in art helping to process subconscious images and turn them into social consciousness (Ioffe, 2006, p. 46). Its aesthetics was oriented toward purity, clarity, and logic as well as originality and the ingenious combination of elements. Constructivism in the social dimension was based on the principle of economy and efficiency. The understanding of constructive principles, however, was far from consensual. Gabo and Pevzner took them for a universal method of creation irrespective of class interests and the construction of social life (Harrison and Wood, 1993, p. 297). They believed in the harmonious unity of pure lines, function, and logic as one finds in architecture. Malevich understood constructivism as a transition (return) to embodied subjectiveness and a betrayal of nonsubjective art (which caused misunderstandings in his relationship with El Lissitsky).

Poetic language is not subject to a law of economy. Principles of the economy of thought and economy of creative force were extremely popular in Russia at the turn of the century. Viktor Shklovsky, one of the founders of OPOYAZ and representative of the formalist trend in the investigation of language investigations, showed in his famous work of 1917 "Art as Technique" that poetry should not defy the general law of economy and effectiveness of speech and put forward an idea of "estrangement." One of the authors he referred to was Herbert Spencer who described ingenious writing as effectively composed in a language that conforms to a principle of economy of reader's attention and mental effort. Shklovsky opposed to this his concern with poetic language which hinders and complicates comprehension because its goal is not an automatic understanding and recognition but artistic vision. The word's function in poetic language is not necessarily that of denotation (Harrison and Woods, 1992, p. 312).

Shklovsky considered the intentional creation of something artificial or "artifice" as basic for the distinction between the routine and artistic languages of poetry and prose. (Algebraisation and automatism in routine speech, abbreviation, symbols instead of words are used for the sake of economy.) Similarly, the visual art of cubism and futurism used a "technique of hampered perception" (Terekhina & Zimenkov, 1999, p. 268). *Zaum* as poetic creation took shape with the absurd, with alogism, with "vsetchestvo." It is associated with intuition, the instant rendering of a psychological state, avoiding clarity and logic, thus asserting an idea of the freedom of the arts that is based upon its purpose. Shklovsky was the first to describe *zaum* as a special language of poetry, moreover, he claimed it to be a trait of poetry in general, working with images which authors are not able to define, but which are implicitly present and make poets suffer from the impossibility of their expression. He gives an idea of "sound-speech" – sounds that strive to be language (Russian futurism, 1999, p. 259). This, then, is the difference between *zaum* and *novoyaz*, between two poles for the creation of words: *zaum* emerged at the height of neglecting and negating tradition, *novoyaz* as the construction of a language for

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the construction of a new life, such that convenience, pragmatism, and economy might allow for it to perform its function as social technology.

Avant-garde art proved to be an apt form of building life in the first years of the cultural revolution in Russia and many artists thought it to be their responsibility to participate in the process, though it obviously could limit their freedom of individual creation. Boris Grois wrote about Tatlin that his choice in favor of the machinery of the new Soviet state probably seemed a more honest choice to him than a return back to the outdated past. Ideas of spiritual and intuitional origin of art in the Russian avant-garde predetermined a special understanding of technology and its role. It is known that the glorification of machines and the technological advance of big cities was not very typical for the Russian futurists. For the organic trend in avant-garde as well as for the followers of suprematism, technology was an alternative to the spiritual force of a human. It was a question of compatibility of humanity and technology in a philosophical sense. As Grois suggested, the Russian avant-garde tended to share an attitude towards the technical rooted in Russian tradition – it is profane, amateurish, and opposed to the Western outlook. He wrote that Tatlin's tower, as well as other objects, from the beginning to end, were merely works of art, "non-functional machines," comparable to Duchamp's ready-mades (Grois, 1993, p. 366-367). The problem of human abilities (for instance, the "widened vision" methods by Mikhail Matushin) was more typical for the Russian avant-garde. The focus was on the social role of technology in the Soviet period, also on the idea of interdependence in the development of art and technology, and how it was realized within synthetic forms of artistic activities.

The language of artistic utopia and the language of social utopia are instruments for building the new reality. The period of the 1900s to 1920s was marked by revolutionary developments in science, technology, art, and society. The language of the visual arts underwent radical changes. Avant-garde art developed its language through experiments of various "schools" that united masters and their disciples. Goals and tasks of creation could be different, though all of them were united by the idea of breaking with tradition and introducing new methods of expression. A similar process in poetry advanced the idea of word creation. An extreme version of this was language deprived of its former meaning. Sound poetry was ready to join music, and graphic experiments with words and texts were part of visual art. Malevich consistently applied the language of the avant-garde to all these arts: graphic, painting, object, poetry, music. They would achieve their pure suprematic non-subjective state in the New reality (Malevich, 2000, p. 18). Philosophical ideas of the time (energy, economy, organization) were reconsidered in the artistic practice and in pedagogical works. Seeking liberation from the dictatorship of tradition and stereotypes in art and historical approach, the avant-garde formed its own utopian vision of the world. Both languages – those of poetry and the visual arts – in the period of the scientific-social-artistic revolution displayed features of affiliation with various kinds of utopia. It seems that nearly every approach to language of this time inevitably brings us to the language of utopia – from revolutionary romanticism and a pathos of new creation to escapism with its new otherworld reality, from technological optimism to spiritual asceticism. New languages had to play an important role in creating new worlds with their constructive principles that vary from mathematical logic to the

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intuitive play with meanings. And obviously, the philosophical and social study of languages in that decade from 1910 to 1920 would be reflected in the sphere of artistic creation.

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Technology and Language Технологии в инфосфере
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Language and Hermeneutics

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Abstract
This essay for the inaugural issue of *Technology and Language* builds on the author's longstanding commitments and forthcoming book on *Material Hermeneutics*. These concern the technological revolutions in imaging technologies which created the ways for material things to "speak", as in visualism and its expansion. Science though its instruments changed perception – but in different ways at different times. Early Modern Science began in the 17th century in an instrumentally optical or "visualist" mode with telescopes and microscopes. Late Modern 19th century Science, more sure of itself and more abstract, drew on the new imaging technology of spectroscopy. In the 20th century, postmodern science expanded from "visualism" as perception became multi-sensory. Tending to the ways in which material things learn to "speak" will reshape all previous historiography and interpretation.

Keywords: Material hermeneutics; Scientific instruments; Perception; Visualism; Technological revolutions

Аннотация
Данное эссе для первого выпуска журнала "Технологии в инфосфере" ("Technology and Language") основана на многолетних исследованиях автора и готовящейся к изданию монографии по материальной герменевтике. Эти исследования касаются технологических революций в технологиях визуализации, которые научили "говорить" материальные предметы, а также подготовили их к визуализму и его вариациям. Наука с помощью своих инструментов изменяет восприятие – но по разному в разные времена. Ранний этап современной науки начался в 17 веке в инструментально-оптической форме при помощи телескопов и микроскопов. Наука модерна конца 19 века, более уверенная в себе и более абстрактная, опиралась на новую технологию визуализации – спектроскопию. В 20 веке постмодернистская наука расширилась до концепции "визуализма", восприятие стало мультисенсорным. Обращение к тому, как материальные вещи учатся "говорить", изменит всю предыдущую историографию и ее интерпретацию.

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Language and Hermeneutics

1942 was the 400th anniversary of Coronado's trip from Mexico to Kansas. In what may appear as a disjointed autobiographical account, 1942 was also the year when I was a young and naive boy in a one-room country school. In my new book *Material Hermeneutics: Reversing the Linguistic Turn* (Routledge 2021) I re-count my disturbance at what I was being taught in that school about our primary colonists, the pilgrims who landed at Plymouth Rock, Massachusetts in 1620, which was 89 years after the Spaniard Coronado reached Kansas (Inde, 2021). Something was wrong – but who was I, young and naive to question this "history"?

In the 1960s, searching for a dissertation topic, I discovered Paul Ricoeur, master of a linguistic hermeneutics from whom I learned so much. Later, tending to science's technologies, particularly its imaging technologies, I wrote *Technics and Praxis* (1979), marking my turn to science and technology. I learned that science, though its instruments changed perception – but in different ways at different times (Inde, 1979). The standard view is that Early Modern Science, largely under Galileo, began in the 17th century. It was instrumentally optical or "visualist" with telescopes and microscopes that were often made by Galileo himself. He forever changed perception – a new micro-world appeared though his microscopes, seven labia of bees, plant cells and more, and the macro-world of the heaven. It was limited to very human "white light" but now it included sunspots, satellites of Jupiter, the myriad stars of the Milky Way, and more that was never before perceived.

Then came Late Modern 19th century Science, more sure of itself and more abstract, with the new imaging technology of spectroscopy and its color-codes for defining sun, stars and the mathematized electro-magnetic spectrum.

In 20th century Postmodern Science imaging technologies began to discover animals. Jane Goodall did not until the 1960s publish her discoveries of chimps and termite probes – nor did we know then of animal perception in terms of thermal, ultra- and infra-sounds, infra- and ultraviolet light. For the first time science expanded from "visualism," and perception becomes multi-sensory.

These multi-sensory technologies of perception drew on all that was invented in imaging with the radio, phonography, even accurate dating technologies such as Carbon 14 (first used in 1940). It is for this revolution in imaging that today anyone can hear dust particles hit Casini, the space probe, or see the old trails of the Silk Road, or Superhenge, 5 times larger than Stonehenge from magnetic imaging underground. So, I would argue that there have been technological revolutions in imaging technologies which created the ways for material things to "speak" and more, thus leading to a "material hermeneutic" which will change all previous histories and interpretations.

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Back to the Future with Writing and Speech

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Abstract
This essay for the inaugural issue of *Technology and Language* suggests a kind of time-travel. As the hand becomes dethroned in writing, the voice might be in speech, and it is with the technologies of the scribal and vocal arts that they can be reclaimed. In the fairly recent past, words, severed from hand and mouth, have been converted into the liquid currency of a global information and communications industry. Technologies followed in step and stripped words of both gesture and voice, reducing them to mere tokens in anonymised circuits of exchange. This condition is here critiqued not in terms of semantics or eloquence but in terms of the traces of writing and speech – what is said not by the what but by the how of the hand and the voice.

Keywords: Hand and voice; Scribal and vocal art; Writing and speech

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* содержится своего рода путешествие во времени. Когда рука исчезает из письма, и голос – возможно из речи, это восполняется с помощью технологий. В последнее время слова, выхваченные из-под пальцев и изо рта, превращаются в ликвидную валюту глобальной индустрии информации и коммуникаций. Технологии, продолжая этот путь, лишили слова жеста и голоса, сведя их к простым токенам в анонимных схемах обмена. В эссе это явление подвергается критике не с точки зрения семантики или красноречия, а с точки зрения отпечатка письменной и устной речи, как в них действует рука и голос.

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Back to the Future with Writing and Speech

Words are human things, never more than when spoken or written by hand. In speech they well up on the breath, their sounds sculpted by movements of the tongue and lips. In writing they spill out onto the page as the hand – now hesitating as it waits for coming thought, now racing to catch up with it – leaves a meandering trail in its wake. It is not just that I speak, or write. My speaking also speaks me: it speaks me into being, into life. And so too, my writing writes me, turning life into text. Whether in speaking or in writing I come into the audible or visible presence of others with ears to listen or eyes to read. You know me by my voice, it is the way I am. And when I send you a letter by post, you know me by my handwriting. Moreover from the weight and inflection of the line, be it of sound or ink, you can tell how I am, how I'm feeling. This is more than words can say, yet words are saying it, not by way of the meanings we attach to them, but thanks to the expressive power of the line itself.

We lose this power at our peril. Never in human history, indeed, has it been at greater risk. For we have stood by as words, severed from hand and mouth, have been converted into the liquid currency of a global information and communications industry. And our technologies have evolved in step. They have allowed language to be distilled from the conversations of life, only to be reinserted into algorithms of computation, as the executive arm of an artificial intelligence. The effect is to strip words of both gesture and voice, reducing them to mere tokens in anonymised circuits of exchange. Cut off in both body and mind from the words we once produced, and that once produced us, we ourselves are set to lose something of our own humanity.

First to go were the traces of writing, a victim of the keyboard. It is impossible to write – in the original sense of scribing a line – with a keyboard. The punctual movements of the fingers, as they tap the keys, leave no mark upon the page. True, with manual typewriters the force of a tap might register in the density of the mark, and perhaps even leave an impression in the surface. Like a pianist, the manual typist can play loud or soft. But as the electronic keyboard replaced its manual counterpart, and as the mechanics of the typewriter gave way to the computations of the word processor, even this residual medium of expression was lost. Today, writing is no longer a scribal art. It has become, rather, a practice of literate composition, or verbal assembly, in which fragments of words, or words themselves, are arranged in different permutations and combinations to create an effect. To read, then, is no longer to allow one's vision to linger on the surface of the page as it follows the traces of inscription. The handwritten line, that had once captivated the eyes of readers, as a vocal melody might captivate the ears of listeners, is now dismissed as a distraction. Reading processed words calls instead for a vision that cuts through paper, as through a screen, in order to recover meanings reflected from behind. The manuscript page has morphed into a glass window.

Imagine a future, not so very distant, in which what has happened to the written word in our own day is about to happen to the spoken word as well. By then, people will have long forgotten how to write by hand, as they have already forgotten how to write with a quill. No longer able to express their feelings directly in their lines, they have

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resorted to a surrogate vocabulary of standardised emoticons. But as corporate and state interests continue to drive developments in information technology, attention turns to speech. If words of writing could be purged, in the name of communicative efficiency, of the surface distractions of the line, then why – ask the developers – should not the same be done with spoken words as well? If the aim of words is strictly to convey information, then they should leave no breathing space for prosody, for the musical qualities of vocal pronunciation that had once lured listeners to follow along or even to join in. The expressive powers of the voice, then, are to be banished from speech just as, in our own time, those of the hand were banished from writing. The lullaby, the lament, the carol and the hum will become things of the past: you will have to visit a museum to hear them, from old recordings. Eventually, people will forget how to sing, as before they had forgotten how to write by hand. Instead, digital synthesizers, operated by neurotransmitters from the brain, will pump out messages, assembled from a standardised repertoire of sounds.

This, to be sure, is a dystopic scenario. And in all likelihood, the so-called 'digital revolution' will self-destruct before the scenario is ever fully realised. In a real world already facing climate emergency, the infrastructure that keeps the virtual world afloat is manifestly unsustainable. Not only are the supercomputers on which it depends consuming colossal quantities of energy; the extraction of toxic heavy metals for use in digital devices is also fuelling genocidal conflict around the world, and looks set to render many environments permanently uninhabitable. What then will become of us? Stripped of hand and voice, are we destined to go the same way as our technology, into mutually assured destruction?

One little invention could save the day, and perhaps the planet too. It would consist of nothing more than a hand-held tube, mounted in a shaft, and filled with a black or coloured liquid extracted from plant materials. The tube is closed at one end, while to the other is affixed a tip of keratin – the stuff of feathers and fingernails – sliced down the middle. On contact of the tip with a surface, capillary action draws the liquid content down through the slit, so as to leave a trace. It is possible to write with this instrument on almost any smoothly textured surface, such as of linen, paper or papyrus. Its expressive potential and versatility are unmatched by any contemporary digital interface. It costs almost nothing to make, from natural ingredients that can be obtained virtually anywhere. It is easy to use, requires no external supply of energy and leaves no pollution in its wake. This simple invention could secure the future of writing for hundreds if not thousands of years, as indeed it did in the past, until the forces of digitisation drove it to the brink of extinction.

Perhaps, as we relearn how to write by means of this device, we will rediscover our voice as well. We'll remember how to sing and speak. In history, humans were speaking and singing long before they began to write. But in the future, it might just be the other way around.

Tim Ingold

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Cybernetics for the Blind: The Reading Machine «Luch» (The Ray)

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Abstract
This essay for the inaugural issue of *Technology and Language* looks at a particular technical device that was to give access to the written word. In the late 1960s Rostislav Muratov proposed the model of a reading machine named "Luch" (Ray). "Luch" was designed for blind people to provide comprehensive access to books, newspapers, and magazines. Muratov understood blindness as "the loss of information" and assumed that his invention would appeal to a desire to participate on one's own terms in the circulation of knowledge and information. Then as now, however, people were content to have texts preselected for them.

Keywords: Reading Machine; Typhlotechnics; Cybernetics; Human-Machine Interaction

Аннотация
В этом эссе для первого выпуска журнала *"Технологии в инфосфере" ("Technology and Language")* рассматривается конкретное техническое устройство, которое должно было обеспечить понимание письменных текстов людьми с ослабленным зрением. В конце 60-х годов прошлого века Ростислав Муратов предложил модель читающей машины "Луч". "Луч" был разработан для слепых, чтобы обеспечить полноценный доступ к книгам, газетам и журналам. Муратов понимал слепоту как "потерю информации" и полагал, что его изобретение обращается к желанию самостоятельно выбирать информацию для чтения. Между тем тогда как и сейчас люди были довольны тем доступом к информации, который уже имели (при нём тексты подбирали для них, а не они сами делали это).

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Cybernetics for the Blind: The Reading Machine «Luch» (The Ray)

In the late 1960s Rostislav Muratov proposed the model of a reading machine named “Luch” (Ray) to the Academy of the Pedagogical Sciences. The machine was able to “transform the graphemes of the typographic fonts of the printed book text to phonetic and tactile signals” (Muratov, 1968, p. 13). The device consisted of “photosensitive resistors”, “miniature amplifier” and “audible alarms”. The engineers who constructed “Luch” were looking forward to using this device with all the current achievements of the “acoustics, optics and radio-electric engineering” of the mid-XX century. “Luch” was projected and designed for the comprehensive reading of books, newspapers and magazines published for a mass audience of blind people. The loss of sight should not block human ability to use the language, to communicate and to study. Adolf Krogius was one of the founders of the Russian-Soviet Academic School of Typhlopsychology. In the beginning of the XXth century he performed many thousands of experiments on blind and sighted people and proved that ”the blind operate in real life with the notions and the concepts equivalent to those used by the sighted” (Muratov, 1968, p .4). The evolution of the mass-education systems and the progress of technologies for the production of printed texts in the XXth century increased the amount and quality of notions and concepts necessary in “real life”. At that time, current events and advanced scientific knowledge were mainly coded and represented to the public in printed form. To keep up with the sighted, blind people needed widest possible access to new texts.

Since 1829, blind people could read the books made for them with the relief-point font invented by the French teacher for blind Louis Braille. Since the 1960s blind readers could get “Talking books” recorded on magnetic tape. When Rostislav Muratov and his colleagues started to design “Luch” both technologies of coding texts for blind people were already well-known. Muratov stressed that Talking books and Braille books were remediated and selected for blind readers mainly by sighted people (Muratov, 1960). His motivation in developing the reading machine was to make blind readers more independent from the selection made by the sighted creators of special libraries. He manifested the new reading machine as an agent “to open for blind readers unlimited access to all existing books, newspapers, magazines” which would make them independent in their self-development.

To get that unlimited freedom of choice in reading, blind pupils were challenged to overcome the complexity of fluent understanding of the tactile signals and the sounds produced by “Luch” while scanning the visual texts. The potential blind readers were obliged to learn a special artificial language to communicate with the machine. It was not an easy task and some weeks of hard training were necessary to reach this goal. Muratov and his collaborators worked out the system of exercises to educate readers to handle the machine for the schools for the blind. Muratov had been the founder and head of the Typhlotechnical Laboratory which was established in 1956 at the Scientific Research Institute of Defectology (Inclusion) of the Academy of the Pedagogical Sciences in Sverdlovsk (Ekaterinburg). In addition to “Luch” the Laboratory invented and

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constructed the photoelectric indicators “Photophone” and “Photoskope” for the scanning of surrounding objects, the sound locator “TPP” warning a blind person of an obstacle, and dozens of other devices. Most of the devices constructed by the Laboratory existed only in the forms of drafts and prototypes, as they were not approved for mass production. The lack of flexibility of the Soviet planned economy was not the main reason of the difficulties in getting the new devices to the mass audience of the blind.

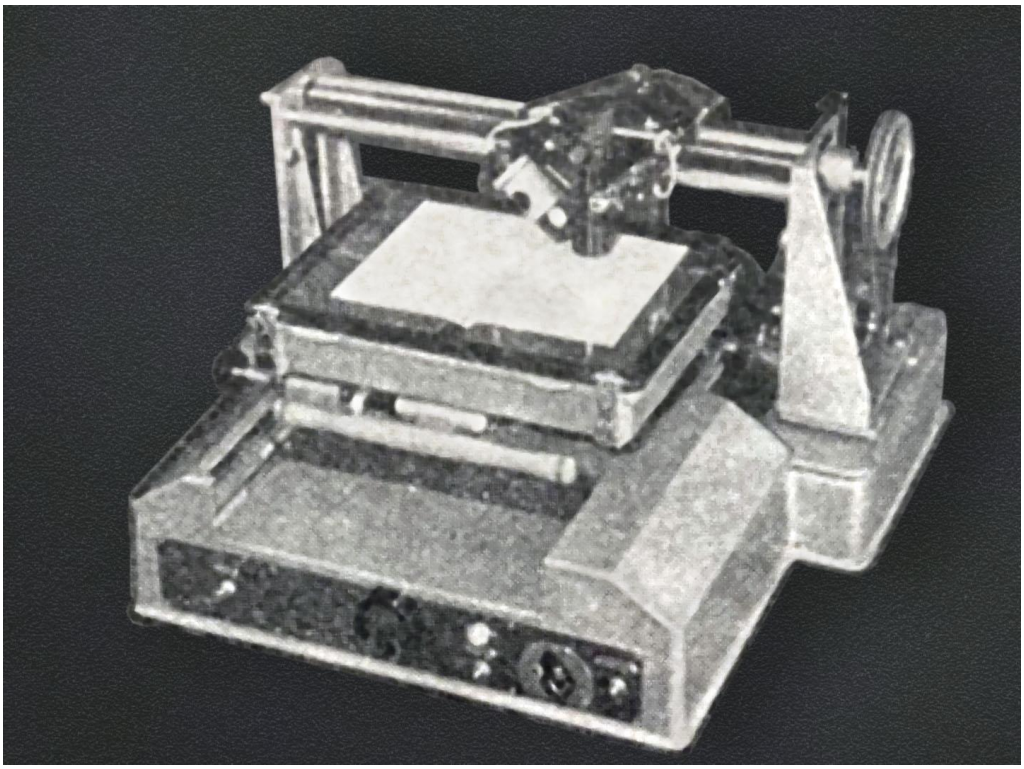

Figure 1. “Luch” (Muratov, 1968, p. 164)

In the theoretical parts of his written works, Muratov considers the blind human as “the damaged link in the chain of information exchange in the society” (Muratov, 1968, p. 15). He understood blindness as “the loss of the information”, “the obstacle.” This gap in the circulation of information could and should be compensated by the usage of electro-mechanical devices. Typhlotechnical devices must provide the humans with the “exactness of the varied important parts of the complicated signal” to prevent “information loss.” In his works technical devices and human bodies are described on the same plane as one system of information exchange. He insisted to name his chosen approach to blindness “cybernetical.” “Cybernetic approach” to the psycho-physiological problem of the dysfunction of the sight on the theoretical level radically destroyed the border separating the human and the machine. This border seems to be imaginary but yet it is rather important for how we understand ourselves. In fact, the border between the human body and the machine is not easily shifted or crossed: The blind people were not very enthusiastic to use the devices that were invented in the Laboratory. Muratov (1968) noted with some disappointment that “many of the blind people do not recognize their

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own need in the availability of access to additional information about the world because of their habit to use a limited amount of information every day" (p. 96). The existence of the possibility of wider access to knowledge and information does not always motivate people to realize this possibility. Muratov (1968) then suggested that the further development of the Typhlotecnick will speed up "the invention of a rather complicated cybernetic device … equal in its functional possibilities to the human brain" (p. 97). From our time perspective we can see that he had in mind the invention of the PC, not yet realized during the times when the Laboratory in Sverdlovsk was active.

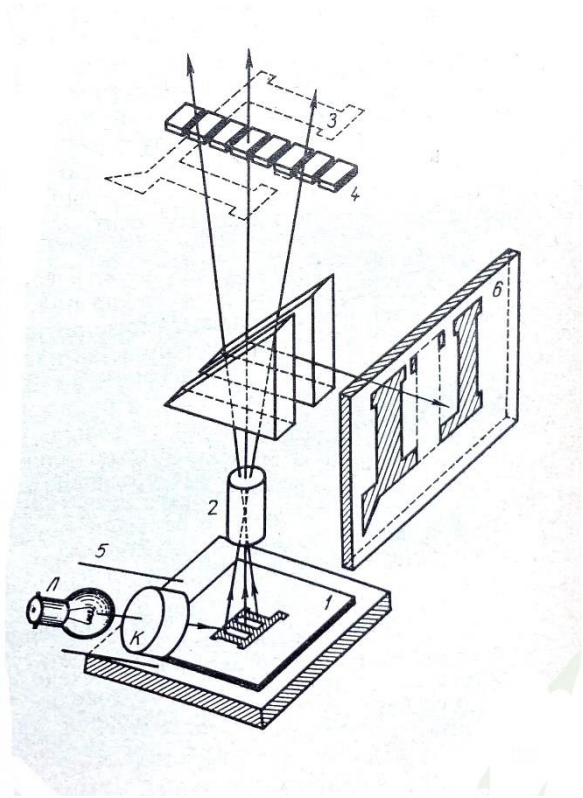

Figure 2. Diagram of the path of light rays in the microprojector of the reading device in the "Luch" (Muratov, 1968, p. 165)

Sixty years have passed since the invention of the reading machine "Luch," and many technical problems that were insurmountable for the Soviet engineers have now been solved. Today, scanners are transforming the typographic fonts to the digital data. Without the participation of the user this data can be represented in any form suitable for comfortable perception. The huge amount of printed texts is now transformed to digital data. However, the problem of how to organize access is still crucial and much discussed by users. Blind as well as sighted readers of digitalised books are now dependent on automated selection by the bots. The lack of motivation by users to widen their cognitive horizons is as striking now as it was in the 1960s. In comparison with the theoretical thinkers of the mid-XXth century, our advantage comes with the knowledge that technical progress provides no guarantee of solving basic human problems.

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The Political Power of the Algorithm

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Abstract
This essay for the inaugural issue of *Technology and Language* highlights that digital technology is transforming not only the way we communicate through language, but the very nature of language, thought and action. Algorithms are deployed to make decisions, to sort and make meaningfully visible the vast amount of data produced and available on the Web. In ranking, classifying, sorting, predicting, and processing data, algorithms are political in the sense that they help to make the world appear in certain ways rather than others.

Keywords: Algorithm; Digital; Communication

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* подчеркивается, что цифровые технологии меняют не только способ общения с помощью языка, но и саму природу языка, мышления и действия. Алгоритмы используются для принятия решений, сортировки и значимого отображения огромного количества данных, производимых и доступных в сети. При ранжировании, классификации, сортировке, прогнозировании и обработке данных алгоритмы обретают политическую силу в том смысле, что они способствуют созданию одного образа мира, скорее чем другого.

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The Political Power of the Algorithm

Digital technology is transforming not only the way we communicate through language, but the very nature of language, thought and action. The call by scholars in cultural and intercultural studies to "epistemically decenter" and "decolonize" language in language education (Bojsen et al. in press; Macedo, 2019) clashes head-on with the power of digital algorithms to select, organize and classify knowledge, predict user behavior and influence people's beliefs and actions (Bucher 2018, Jones 2019, Amoore 2020). Digital communication enhances the visibility of addressers, multiplies the number of their addressees, amplifies the content of their message, strengthens its phatic impact, and democratizes their modes of information. But beyond this structuralist Jakobsonian view of communication, there is a more insidious way in which digital technology itself is re-centering our lives and re-colonizing our thoughts. Post structuralist scholars of technology, e.g, Poster (1990), Latour (1999), van Dijck (2013), Pennycook (2018), have focused on the alliance between data processing and the technological construction of social reality.

The algorithms of social media platforms are not just technological devices, "coded instructions that a computer needs to follow to perform a given task" (Bucher 2018, p. 2). They are ways of thinking that blend with human minds and purposes.

> Algorithms are deployed to make decisions, to sort and make meaningfully visible the vast amount of data produced and available on the Web . . . In ranking, classifying, sorting, predicting, and processing data, algorithms are political in the sense that they help to make the world appear in certain ways rather than others. Speaking of algorithmic politics in this sense, then, refers to the idea that realities are never given but brought into being and actualized in and through algorithmic systems. (Bucher 2018, p. 2)

Twitter and Facebook in particular have become political tools for populist presidents, but also for Black Lives Matter and other movements for social justice.

Critics have focused on the (unholy) alliance between business models of technology (to make a profit) and their avowed social and epistemological mandate (to connect and inform). Such is the case of Google and Facebook that despite their mission statement have allowed questionable language practices on their platforms in the name of freedom of speech and freedom of commerce (Vaidhyanathan 2011). Facebook in particular has been accused of programming its algorithms for maximum user participation by encouraging sensationalism and fostering outrage.

Algorithms don't only enable people to make decisions, they are themselves algorithmic decision-making devices. What an algorithm enables the computer to do is give its users "actionable output" (Amoore 2020, p. 12). For example, it can make it distinguish, say, a protest from a demonstration or a riot. But, by assembling verbal propositions that express its reasoning and reducing the multiplicity of phenomena to a single actionable meaning, it enables the computer to decide what is worthy of attention, i.e. what is "interesting", and to act upon that decision.

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Algorithms are "predictions based not on linear sequences of causes and effects, but on non-linear recursive functions of big data that supply the contingent probability to all the layers within the algorithm . . . Algorithms learn by inductively generating outputs that are *contingent on their input data, using statistical notions of what is interesting*" (Amoore, 2020, p. 12, my emphasis).

Such decisions can have disastrous consequences, such as when a U.S drone mistakes a wedding party for a terrorist grouping. But it can also bias the results of exams as was the case when the grading of candidates at the International Baccalaureate was left to algorithms (Broussard, 2020). Because the input data included not only the previous excellent grades of a given student, but the historical performance data for her school and the teacher prediction of her grades, one Latina student got rejected because of the algorithm's assumption that students from that school, who were mostly low-income students of color, would continue to do poorly, and because teachers tended to have lower expectations for Black and brown students compared with white students.

Some critics have focused on the ethical aspect of algorithmic systems from a poststructuralist perspective. Louise Amoore rejects current definitions of algorithms as unitary, sequential lines of code, and she questions approaches that wish to increase the transparency of algorithms to address ethical issues. She offers instead a paradigm that envisions algorithms in terms of partiality, indeterminacy, and contingency, and that counters their nefarious effects by "reopening the multiplicity of the algorithm, digging under the stories, and attending to the branching pathways that continue to run beneath the surface" (Amoore, 2020, p. 162). Such a line of thinking speaks for reinstating the teaching of literature in language education, not to have students dissect its structures but to illuminate the ethical dilemmas and contingent truths that literature reveals. It is an urgent reminder for language teachers, eager to use the communicative facilities offered by social media and Google Translate, that language use is not just the ability to hear and be heard, but the obligation to listen and be listened to and respected in the concrete particularity of each person involved.

Claire Kramsch

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Engineering Education – Convergence of Technology and Language

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Abstract
This essay for the inaugural issue of *Technology and Language* demonstrates the close relationship between technology and language with just a few examples from engineering education. Just like a name becomes meaningful in the context of a sentence, the meaning of an engineering object depends on external circumstances. This relation between technology and language is not the same in all Engineering cultures and languages, however – as testified by the differences between engineering education in Russian and English.

Keywords: Engineering education; Language of kinematics; Russian and English engineering languages

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* рассматривается тесная взаимосвязь между технологией и языком на нескольких примерах из инженерно-технического образования. Подобно тому, как имя становится значимым в контексте предложения, значение технического объекта зависит от внешних обстоятельств. Однако эта связь между языком и технологией не одинакова в различных языках и культурах, о чем свидетельствуют различия между инженерным образованием на русском и английском языках.

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Engineering Education – Convergence of Technology and Language

The knowledge and experience gained in technology are concentrated in a system of concepts, designations, relationships and other phenomena. For engineering, this system is a convoluted, condensed knowledge in the form of a symbiosis of linguistic and non-linguistic elements. Mastering a profession involves learning the rules of compressing, coding relevant information and the rules of decoding it. Engineering educational practice provides ample room for reflection on the relationship between technology and language.

The purpose of a study course on the *Theory of Machines* is, *inter alia*, to systematize the mechanisms and their parts. At the same time, students have to learn a specific language, which Franz Reuleaux referred to as the *language of kinematics*. The units of this *language* are names of kinematic pairs, links, and there are rules by which these units are combined and assembled to form a kind of sentences, relevant to the structure of mechanisms. Following Ludwig Wittgenstein's logic, units of the language of kinematics are related to sentences (and utterances) in the same way as semantic knowledge corresponds to factual knowledge about an object. The logic-semantic thesis of Wittgenstein that a name only becomes meaningful in the context of a sentence is expressed in engineering science in the fact that the name of an object depends on certain phenomena external to it. Thus, one of the main objects considered in the course on *Strength of Materials* is a "bar." Depending on the type of the external load on an object, the semantic meaning of this name, that is, knowledge of the possibility of certain facts, can be transformed into the factual meaning represented by a triad: bar = *rod* (for tension – compression), bar =*shaft* (for torsion), or bar = *beam* (for bending).

The relationship between technology as a system of knowledge and language as a system for capturing this knowledge becomes particularly important with the internationalization of higher engineering education. Different natural languages follow their own logic, so even within the same course, objects with the same content may have different names in different language systems (English-Russian-Chinese, others). In engineering courses in Russian, mental and speech constructions often tend to capture and describe a *situation*, and in English to express *process* and *action*. For example, in all Russian textbooks for the course *Strength of Materials* there is a section «Stress & Strain at a Point» (naming, stating a certain phenomenon). The student will not find a similar section in an English-language textbook if he/she does not understand the logic of a study material, namely that stress and strain change when the position of an elementary plate/volume changes in the plane/space. In the English textbook the section is called "Stress and Strain Transformation" (action).

It is important for teachers and students to understand the interaction between technology and language that reveal itself in many ways.

Eduard Krylov

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On the Question concerning Animatechnics

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Abstract
This essay for the inaugural issue of *Technology and Language* explores the notion of animatechnics in its two meanings: living technology and animal technology. On the one hand, there is a fiction or utopian component in this notion, on the other hand, it raises the question about technical life beyond the human: Can technology be alive – other than metaphorically? How does animal technical life work? These questions can be fused into one and suggest the notion not of the command but of the request as a technical operation.

Keywords: Animatechnics; Fiction; Animal; Tool; Request

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* ставится вопрос об аниматехнике, о двух возможных значениях этого термина: живые технологии и технологии животных. С одной стороны, в этом вопросе содержится элемент фикции и утопии, с другой стороны, он возникает как вопрос о технической жизни за пределами человеческого, об инструментальном поведении животных. Может ли техника – не метафорически – быть живой? Как устроена техническая сторона жизни животных? Две вопросительные линии соединяются этим эссе в один вопрос: в вопрос о просьбе как технической операции.

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On the Question concerning Animatechnics

0. The question I intend to raise has two dimensions. The first dimension is best mapped out by fiction; the second by some contemporary discussions in the philosophy of technology. Two dimensions and two points of view: one can be called alien, the other animal. Both of them lead beyond the human, all too human – to representations of technology, and they unite in what, following Thomas Nagel, can be called *sympathetic imagination*, puzzled by the question about 'what is it like ...': What is it like to use tools as aliens would use them? What is it like to use tools as animals would use them?

1. The fictional story *The Universe of Things* by Gwyneth Jones (1992/2011) is part of the "Aleutian" trilogy, a story about the colonization of the Earth by aliens, the Aleutians. It describes how an Aleutian arrives at a service station in car from Earth and asks a (human) mechanic to fix it. This is strange, since the Aleutians usually do not use Earthling technologies. Not only are their own tools and vehicles better and more environmentally friendly. Though they have been created, they are *alive* (they are built with bacteria from the aliens' intestinal flora). Moreover, it turns out that in the language of the Aleutians there is no concept for animals, for designating a life that would differ from their own. They communicate by way of telepathy – among themselves and with all living things – the messengers of "a talking world, a world with eyes." While repairing the car, the Earthling mechanic reflects on the differences between the tools of humans and Aleutians. Even if we ever were to invent a self-aware machine, he thinks, we will not be able to give up our creative role, discard ourselves as creators and rulers over our own creations. Our animals can become pets, but never one of us. We are unable to overcome this separation and isolation of each individual being, and no technical means will help us do so. Our "machines promise, but they cannot perform. They remained things, and people remained lonely." It turns out that the Aleutian's car is infected with alien "technical bacteria." The mechanic begins to work with it as a living creature, and, thus experiences a revelation (albeit frightening) of the aliens' *living technology*: The car speaks to him, the spanner or wrench in his hands grows skin, pulsates, breathes and merges with his body. "He had seen another world come into his life, reached out to grasp the wonder, and only found something worse than empty air. He had wanted the alien to give him dreamland, somewhere over the rainbow. Instead, he had found an inimical Eden – a treasure that he could no more enjoy than he could crawl back into the womb."

So, in the "inimical Eden" a first part of the question about animatechnics presents itself. Can technology be alive – other than metaphorically?

2. Perhaps, in order to get in touch with the "inimical Eden," it is not necessary to wait for the arrival of the Aleutians, who will undermine our naive isolationist narcissism. The animal world of our own planet constantly insults human self-esteem. In the first half of the last century it was generally believed that tools and instruments reliably indicate that they belong to humans and mark human emergence, that is, an active and intelligent

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attitude to the world. Humans were thought to be the only creature leading an instrumental life – until the 1970s and especially the work of Jane Van Lawick-Goodall (1970) on the tool behavior of birds and primates. The border separating and isolating humans from animals began to thin and melt before our eyes. After half a century of research on animal tool behavior it became clear that technical life is found, as in the *panpsychist* expression of Thomas Nagel, *all the way down*.

In biology, there is a general scheme for defining an animal tool: it is a modified material object – at least separated from the environment or from the animal's body – that is used for the purpose of a presumably effective impact on the environment or other objects. In the variety of animal tools, there are several groups: *proto-tools* (unmanufactured objects that are used as tools: stone anvils, baits), *tools* themselves, *meta-tools* which are used for making or obtaining other tools, *associated* or *sequential* tools which are applied in a specific order, and finally, *social* tools which involve the use of other living bodies as tools. To this last and most astonishing group of tools, we venture to add *anti-social* tools, which involve using a dead body as a tool where *instrumental 'change' amounts to mortification*.

Now, the second part of the question of animatechnics is the question of nonhuman (animal) technical life. How does animal technical life work?

3. We can catalogue the tools used by different animals throughout time. Primates actively make – often in four or more steps – wooden and stone tools. New Caledonian crows accurately select and use sticks, hooks, their own feathers and leaves to hunt insects. Leaf-cutting ants make technical objects from leaves, subjecting them to rather complex processing, and so on. Note that research on the technical life of animals suggests extremely ephemeral tools, such as water jets used by spinner fish (banded archerfish) to hunt insects – as well as by freshwater stingrays (*Potamotrygon castexi*) to extract food from hard-to-reach places – or such as the extracellular mucus of slime molds (*Physarumpolycephalum*), which plays the role of 'external memory.' The difficulty that appears in connection with such tools is the difficulty of definition. As Christopher Baber points out, if we consider the tool as an external extension of the body, the question arises how to distinguish one from the other – how to distinguish the body from its tools. He himself suggests that a distinction should be made on the basis of "cognitive activity": the tool is not innate, it requires discovery, invention and a certain athleticism in use, going through trial and error (Baber, 2003, p. 7-8, 2). The tool is not given; it requires that the body *adapt* to its use. The implicit presumption on which Baber's argument rests, however, is that *the instrument cannot be alive*. This is the reason why there is no place for social tools in his research. A tool can be considered something that *was* a living body or part of it (feather, bone, skin), but cannot be considered a living body. As with the auto mechanic in *The Universe of Things*, tool use must not begin until we are sure that the spanner is not breathing.

4. In social tools, we find the unity of the two parts of the question about animatechnics. In them, animals use *a living body as a tool*. The real virtuosos of social instrumentality are ants, who build bridges and other arched structures, roads, bivouacs, rafts, and traps

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out of their concatenated bodies. It is not only a fact that these complex objects are alive and ephemeral (they do not exist separately from use), but it is also a fact that they do not have an owner, there is no individual who is their privileged user. This is a tool without a master, a wedge (living its own life) without an auto mechanic. In order to demonstrate what the 'argument of animation' contributes to the definition of an instrument, it is enough to conduct a thought experiment. Imagine that the ant bridge was built by living ants – from the dead. This bridge would be much easier to recognize as a technical object. Thus, the protective and camouflage carapace, which is made from the corpses of ants by the assassin bug Acanthaspispetax from the family of Reduviidae, is obviously a composite tool. In contrast, it is more difficult to determine as such a bivouac composed of interlocked live ants of the subfamilies Dorylinae and Ecitoninae for the protection of the uterus and brood, which breaks up for further movement of the nomadic colony. Why is that? The main reason can perhaps be found in the structure of the very concept of 'tool.' As Heidegger wrote, the tool disappears from the (theoretical) field of vision when it is in use – it becomes an object of contemplative comprehension only in case of failure, loss of use. However, in the case of *The Universe of Things*, the animated spanner becomes – egregiously – noticeable. It literally catches the eye not because of breakage and failure, but on the contrary, due to its *excessive serviceability* and life which puts its handy and obedient instrumentality into question.

5. In philosophy (especially after Heidegger's *The Question Concerning Technology*), criticism of the instrumental understanding of technology prevailed. However, it seems that to get to the question of animatechnics, we need to go back to instrumentalism. First of all, Aristotle used the concept of "animate instrument," which he introduced in the *Politics*, to define the slave. The slave is described *physically* as a special *body* that is located in the gap between nature and the master, rendering – through his use as a tool – the latter a (free) human being. The slave instrumentally mediates the master's relationship with nature, being in the zone of indistinguishability between the human and non-human. Moreover, the slave is defined by Aristotle by the syntagma "use of the body" (ἡ τοῦσώματος χρῆσις, 1254b 18). In other words, the slave himself *uses his body as a tool*. The development of the concept of instrumentalism in Aquinas makes an interesting correction: Thomas considers the instrument in the context of the doctrine of the sacraments, revealing, in addition to the four causes of Aristotle, the fifth, *instrumental cause*, which assumes that something participates in action not by its own power, but instrumentally, so that it acts by the power of another. The instrumental cause is autonomous and operates according to its own internal law. The paradigm of the instrument in theology is Christ; in liturgy, it is the priest. The tool is divided into two operations: the one that depends on its shape and the one that is imposed on it by the master. The most remarkable thing here is that the tool is autonomous and does not depend on the principal cause: the axe does not know the object that is being made with it, but it cannot be made without the axe. In the future, the logic of instrumental cause fluctuates between absolute obedience (Francisco Suarez) and self-willed autonomy, absolute control and getting out of control. Summarizing the development of the idea of

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instrumentality in Western thought, Giorgio Agamben states that it is the concept of an absolutely obedient instrument that constitutes the paradigm of modern technology, outlining the symmetry between the slave and the machine. Slavery is to ancient humanity what technology is to modern humanity: both, as *bare life*, are beyond the threshold that opens access to the truly human condition (and both show themselves inadequate to this task: the modern way turns out in the end to be no less inhumane than the ancient one) (Agamben, 2015, p. 77-79).

6. In the midst of plants, slime molds, ants – and Aleutians, the history of the question of the animate instrument seems to be paralyzed or in a *freeze* (in the technical sense of the word) between its two poles – prehistoric and posthistoric, prehuman and posthuman. The restart of this history could begin with a reference to the accounts of technical thought, where the question of the tool is put in a fundamentally different way, perhaps with the American philosopher Steven Shaviro who wrote the foreword to Gwyneth Jones's *The Universe of Things* – thus, as it were, in a mirror of his own book of the same name. Conceptualizing the "inimical Eden" he comes to radical panpsychist conclusions, to the need to recognize that the feeling is found *all the way down* (Shaviro, 2014, p. 101). However, he does not ask the question of the animated spanner, that is, the question of how to lead a technical and instrumental life in a world in which everything has feeling. What does it mean to use a living body as a tool – or, more precisely and radically – what does it mean to use an instrument as a living body?

7. At the beginning of the twentieth century, the outline of an answer to this question was suggested by the pananarchist philosophers Wolf and Aba Gordins, who developed a very peculiar ontology of technology. According to the Gordins Brothers technology plays a role similar to that played by the technology of fire in stoic ontology (πῦρ τεχνικόν). In this perspective, the whole technical (pantechnical) world is indistinguishable from the panpsychical one: everything feels, everything leads a technical life – that is, on different levels everything invents in invention, everything adapts itself athletically to everything else. In this world, the spanner that the Earthling mechanic holds in his hands is *already alive*. How to handle it? By means of a word, but a special one – a word which leaves no room for a command or an imperative mood; by means of a *request*:

> we do not think of power and impact […] as the violent influence of an object on an object, we think of it as a property, as an internal entity. And this is why the word here means "a request"; we request something of an object. Simply, it perceives our action freely, voluntarily, according to its inner properties. (Gordins, 2019, p. 121)

8. Perhaps
the request as a technical operation
– this is what we must first *learn*
in order to approach *the question of animatechnics*
– and to make *the machines' promises*
come *true*.

Eugene Kuchinov

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The Uprising of the Chinese Language in a Technological Age

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Abstract
This essay for the inaugural issue of *Technology and Language* shows how the rise or „uprising“ of technology also produces an upheaval of language in China. This concerns not only the relation of literary language and so-called internet language which is a hybrid of symbols, sounds, images, and text. It also concerns the languages of ethnic minorities as well as the relation of Chinese to English. Not only in academic publishing there is a shift from the consideration of literary vs. non-literary languages to that of valid vs. invalid ones. It is not the expression of thoughts but the recruitment of an audience that validates writing. These and other changes cannot be described simply as a degradation of language but need to be viewed as an uprising also in terms of a liberation of language.

Keywords: Chinese; Language; English; Communication; Technological age

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* говорится о том, как «восстание машин», или развитие технологий, приводит к языковым изменениям в Китае. Это касается не только различий между литературным языком и так называемым интернет-языком, который представляет собой гибрид символов, звуков, изображений и текста. Это также касается языков этнических меньшинств, а также отношения китайского языка к английскому. Не только в научной литературе происходит сдвиг от противопоставления литературных и не-литературных языков к анализу действующим или недействующих языков. Главным становится не выражение мыслей, а форма, подходящая для аудитории. Эти и другие изменения нельзя рассматривать как деградацию языка, скорее их нужно понимать как развитие языка в современном мире.

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The Uprising of the Chinese Language in a Technological Age

Our age is an age of technology rather than of science. The naive view in the 20th century that technology is an application of science, is obviously out of date. In fact, the view that science is a privileged, authoritative or “noble“ way of searching for truth has never dominated in China. Instead, the reason to accept science is that it can help achieve the practical goals of the industrial technological complex. With the ever more profound integration of science, technology, industry, and the military, the newly emerging concept of "technoscience" has easily gained acceptance by many Chinese scholars. In short, at the turn of the 21st century the rise and “uprising of technology” is dissolving the knowledge hierarchy of noble science and craftsmanship, of science and technology.

In terms of a broad definition of technology, the whole of language can be regarded as a technological tool for communicating information and ideas. Even from a narrow definition of technology, language includes the crucial features of a technology for its existence and evolution: According to Marxism, language originated in labor marked by the use of tools. Without technology, it is only intuitive activity but not labor. To organize work, language must be used as a communication tool. In other words, language has a natural basis such as the evolution of speech organs, but its sociality is of greater importance, which corresponds to the relationship between the natural basis and sociality of technology.

The dichotomy between nobility and vulgarity in language has existed all over for a long time. When the technological age comes into full swing, the “uprising of technology” also shows up increasingly in language. Writing has always been superior to speech and painting in China, as evidenced by the worship of written texts and writing tools as cultural artefacts, including the traditional superstition that paper with written characters on it is a sacred kind of thing. Speech is divided into official and popular languages. In the *Classics of Poetry*, the earliest collection of poetry in China, there is a division of Feng (风), Ya (雅) and Song (颂), with an obvious sense of class distinction. Writing is divided into Jing (经), Shi (史), Zi (子) and Ji (集), with a sense of ranking as well. Popular novels were lacking in prestige for a long time. Derrida criticized the Western tradition as a phono-centrism, which seems to be different from the situation in China. He also distinguished between good and bad writing, the former is logos, eternal and otherworldly, while the latter différance, mortal and mundane. He hoped to deconstruct the suppression of writing. There is a similar condition in Chinese, requiring a liberation movement for language as well.

In the technological age, the criteria for nobility and vulgarity of language are dying out, or, the criteria are becoming diversified and localized. The information revolution and artificial intelligence are blossoming, while the monopolistic power of writing is rapidly declining. From now on, it will be the world of sound, image, and even touch and smell. In China, people begin to use a lot of pictures, emoji and memes in communication, various means of communication with audio materials and short videos have become more popular. Internet language imposed a shock on classic language, becoming a powerful subversive device for fashion, youth and empathy. Spelling becomes less and

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less important. What matters is that the recipient can understand it. Instead of being envious of the sustainability of some words, people hope that their speech can become an instant hit.

Classic literature and traditional ways of writing are losing readers day by day, while various forms of internet literature for fast-moving consumption have become extremely popular – the problem is not that people read less and less, on the contrary, they read more and more, but they have no will to read “noble” texts, and literature in a conventional sense will disappear completely in the long run. There exist no longer literary or non literary languages, but only valid and invalid ones.

Even for the expression of academic viewpoints, their acceptance will be poles apart owing to different technical media. It cannot simply be assumed that serious thoughts will not get attention. Apparently, two trends of China's academic journals are emerging: 1. they are multi-channelized, i.e. simultaneous efforts on paper media, the internet, official accounts, Weibo, audio platforms and short video platforms; 2. they are media-savvy, i.e. journals of humanities and social sciences that are paying attention increasingly to timeliness and levels of concern when selecting topics, soliciting contributions, publicizing or marketing.

Classic writings‘ loss of their noble status is closely correlated with a technological assault on the powerful standing of authors. Language is the communication tool among people, while the hierarchy of power between people has shaped the opposition between indoctrination and self-expression. The voice of the powerful is far-reaching, their words imply listening and obedience by others, while the expressions by the powerless often take the form of an unheard monologue or unspoken criticism that cannot be heard by the rulers. From the perspective of language, the highest goal of the internet revolution is the cultural revolution, i.e. a linguistic utopia where everyone can use language freely, communicate equally and fairly, where there is no distinction between author and reader, and the inequity between indoctrination and expression is abandoned. What matters is not what to say, but who is willing to listen to you. Previously readers also wanted to "silence" authors, this age of technology has made it a reality.

The movement against hegemony of English is part of the uprising and also rises in this age. Different from the alphabetic writing of English, Chinese writing is ideographic, which is naturally more closely related to graphics. This could be an important reason why art was developed while music was undeveloped in traditional Chinese culture. In the multi-media age, Chinese language will develop along with the technology trend of the rise of graphic language. The animation *36 Chinese Characters* (1984) provides outstanding evidence: all of its animation elements are Chinese characters. In the academic field, many Chinese scholars have recently called for opposition to the academic hegemony of the English language, including getting rid of the prejudicial faith in English academic journals and objecting to the academic evaluation mechanism that is merely based on SCI and SSCI. And indeed, it would appear that the spread of Chinese culture needs to overcome obstacles and pay a higher price due to the hierarchy of languages and the unwarranted dominance of English.

Within Chinese language, minority languages are also gaining their due strength with the help of technology. According to official statistics there are 55 ethnic minorities other than Han, of which more than 20 have only spoken and not written languages. The

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development of modern science and technology has not only produced a great challenge to the survival of minority languages, it also provided unprecedented opportunities for their prosperity. For minority languages without written language, instant audio and video provide an ideal way for the ethnic members who live increasingly apart to learn their mother tongues. Compared with Han, ethnic minorities tend to be good at singing and dancing and have more distinctive cultural characteristics, which provides advantageous conditions for more people to pay attention to the spread of ethnic minority languages and cultures. For example, the fact that Mongolian and Tibetan languages are now popular is related to the popularity of folk songs; Dongba characters have gained a lot of fans because Lijiang has become a well-known tourist attraction on the internet.

The uprising of language will inevitably encounter strong suppression by those in power. In a certain sense, the suppression of TikTok by Trump and his allies signifies the suppression of both, graphic language and Chinese language. It could be expected that more similar conflicts on language will take place in the future. In fact, Trump himself is a representative of the uprising of language in this technological age. He is known for his “Twitter Presidency” and benefitted greatly from the uprising of new language communication technologies against traditional ones. Therefore, he finds himself "suppressed" by the traditional media with whom he never had a smooth relationship.

Even on Twitter and Facebook, Trump and his campaign team have been banned again and again, which demonstrates vividly that though the sphere of language in the technological age is more open and tolerant, it is not an ideal linguistic utopia. In other words, linguistic utopias can be continuously approached, but never actually reached. The power struggle will continue in the sphere of language in the future, whereas the violent component is weakening, and the technical component is strengthening. To avoid the accusation of violation of freedom of speech, a technocratic approach to language will become a main approach in the language power struggle, such as the suppression of newly emerging hybrid internet languages on the grounds of national security. In many cases, however, a technological and thus seemingly technocratic approach to language turns out to be technocratic in name only and not in spirit. For instance, the out-of-control technology of shielding readers and listeners from sensitive or offensive words and the technology of firewalls undermine the goal of social operational efficiency that is advocated by technocracy.

As Orwell said, there is no freedom without free speech. What is the relationship between languages of freedom and technologies of freedom? In the age of artificial intelligence, what is the fate of language in the future? In any case, reflecting on the relationship between language and technology, one cannot ignore the important dimensions of knowledge and power, which are closely related to the future destiny of our human being.

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Philology and Technology: Notes

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Abstract
This essay for the inaugural issue of *Technology and Language* contrasts two visions for the future of philology. One seeks to establish it alongside philosophy and mathematics as a cross-cutting discipline for making sense of texts. The other takes technology seriously and renders texts materially present, exploring texts as untamed objects. What is happening with the love of language in a world in the overwhelming presence of so many things defined by their technicity? It is not content to discover the meanings of words and sentences, it seeks out the textualities of technology.

Keywords: Philology; Textualities of Technology; Hermeneutics; Love of Language

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* противопоставляется два направления будущего развития филологии. Одно из направлений стремится утвердить филологию, наряду с философией и математикой, в качестве сквозной дисциплины для понимания текстов. Другое – широко использует технологии, и тексты исследуются как неизведанные материальные объекты. Что происходит с любовью к языку в мире, где огромное количество вещей определяется их технической стороной? Ей недостаточно обнаружения значений слов и предложений, она ищет текстуальности технологий.

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Philology and Technology: Notes

Philology is experiencing its own encounter with technology and the world technology is creating. There are debates going on within the field, not always clearly thematized, about what is (or may be) happening with the love of language in a world infatuated by the λόγια or the words of technicity.

As one example, consider *World Philology* (Pollock et al., 2015), a collaborative effort to revive the discipline. In his introduction, co-editor Stephen Pollock outlines historical developments in the field and its problematics. The philological seminar of late eighteenth century Germany offered, Pollock says, the model for Wilhelm von Humboldt's university. The collapse of that model began during the late nineteenth century. Friedrich Nietzsche was its last great exemplar. The dissolution.

> occurred over the course of the first half of the twentieth century, when philology's subdisciplinary children, including national literary histories, literary criticism (and later, "theory"), comparative literature, and (kin of more proximate origin) linguistics, believed themselves sufficiently mature to rebel and leave home…. [W]eakened by subdivision, both philology and its components, instead of hanging together, have now all been hanged alone after the contemporary attack, unprecedented for its depth and extent, on the humanities as representing little more than a market inefficiency in the newly corporatized Western university. Philology does not produce patents, say the administrators; indeed, say the students, what is the point of learning to read well when all you need to know is how to count? (Pollock, 2015, p. 3).

Philologists have further contributed to their marginalization "by narrowing their sights to the smallest questions [and turning] the discipline's vaunted 'rigor' into rigor mortis" (Pollock, 2015, p. 4).

Since the 1990s, however, a modest "return to philology" effort has emerged across a small to large spectrum. At one extreme are reaffirmations of the value of scholarly skills in historical text curatorship, especially with the use of new technologies of imaging and data processing (digital philology, computational philology). At the other are efforts "to rethink the very nature of the discipline, transhistorically and transculturally" (Pollock, 2015, p. 6). Israeli filmmaker Joseph Cedar's (2011) *Footnote* dramatizes the tension between these extremes in the form of antagonistic father and son philologists: The former has spent his life comparing words in different versions of the Jerusalem Talmud, the latter is an academic rock star of creative Talmudic interpretations.

Pollock and colleagues opt for the latter. Their basic take is to de-provincialize the discipline by inquiring into and engaging with "what philology has been over time and space, in the rest of the world no less than in Europe, and before the modern era" (p. 12). To this end, *World Philology* collects 14 essays by as many authors examining cases of emergence, practice, and theory in classical Greek, Latin, Hebrew, Arabic, Sanskrit, Chinese, Persian, Turkish, Japanese, and German in Europe, the Middle East, India, and China.

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"On the evidence offered by the essays," Pollock posits

> philology in the singular as a unitary global field of knowledge [reincorporating the lost disciplines of hermeneutics and linguistics] as the discipline of making sense of texts, whatever sense we may wish to attribute to "sense," and however much the corpus of "texts" to be included in this discipline may change over time. Philology is neither the theory of language (that is now the domain of linguistics) nor the theory of truth (that is philosophy), but the theory of textuality as well as the history of textualized meaning. If philosophy is thought critically reflecting on itself, then philology may be seen as the critical self-reflection on language. Under this description, and with the materials offered in this book, we recognize that philology has been at once as historically deep as any other form of systematic knowledge and as global as language itself. Both in theory and in practice across time and space, accordingly, it would seem to merit the same centrality among the disciplines as philosophy or mathematics. (Pollock, 2015, p. 22)

This is a hyperbolic thesis. It is, Pollock nevertheless asserts, one that is "gaining traction [through] the decades-long critique of disciplines" that are promoting "attempts at reconstruction, reform, or renewal of the university … all over the world – most prominently in China, India, and the European Union, but also in the United States – [as also] often prompted by market imperatives … to produce a new, truly global institution" (Pollock, 2015, p. 23).

The failure of any essay in the collection to systematically rather than rhetorically address the power of science, technology, engineering, mathematics (STEM) and economics cannot help but call Pollock's belief into question. While noting the use of technologies in philological work, there is little recognition of philological methods in making sense of the data produced by technoscientific instruments as texts (as in the work of Bruno Latour and others). Pollock to some extent confirms his earlier admission that internal factors have contributed to the decline of the discipline. Ignoring the scientific and technological foundations of the globalization on which he proposes to rebuild– further weakens his case – even more so since that globalization at the time of the publication of *World Philology* had been revealed as a problematic power by the economic meltdown of 2008-2009. The situation is made even more fraught by the Covid-19 pandemic of 2020-2021, and can only be projected to intensify further as the capitalist driven engineering of the Earth introduces new paradoxes of power and fragility into the tactile world, not just our languages.

Another thesis regarding philology, one with a place for philological engagement with the textualities of technology, is presented in *The Powers of Philology* by confessed non-classical philologist, Hans Ulrich Gumbrecht (2003). Like Pollock, Gumbrecht distinguishes the technical craft from hermeneutics. Yet contra Pollock, Gumbrecht (2003) gives priority to the craft of engaging with physical objects: "What I want to discuss under the title 'the powers of philology' [is] disruptive within the official academic image and self-image of philological practice" (p. 6).

To practice the techniques of philological craft at the root level enacts a series of formative desires for presence in a world that has become progressively subordinated in the scholarly world to hermeneutics. For Gumbrecht, hermeneutics as such is not enough

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and in fact rests, we might say, on tangibilities. The careful handling of the shards of damaged codices, identifying and piecing together parchment fragments, grasping a magnifying glass to detect palimpsest obscured letters, all manifest a desire for physical possession. Archeological philology in rural China, digging in the earth for oracle bones and then examining their surfaces for glyphs to be catalogued and discussed in multiple re-examinations is scholarship for dirty hands. Additionally, combining philology, archeology, and computers, papyrology is now "Revealing Letters in Rolled Herculaneum Papyri by X-ray Phase-contrast Imagining" (Mocella et al., 2015). Here technologies are making present again texts buried by the eruption of Mount Vesuvius.

Such text editing first seeks to re-embody a text as a basis for then imaginatively re-embodying an author. Commenting grows out of and reinforces a desire for explanation with context. But hermeneutic historicizing leaves the text itself as a sacred object. Philological pedagogy presents texts again as untamed objects inviting exploration. In diverse ways, Gumbrecht (2003) writes, "all philological practices [are generated by and] generate desires for presence, desires for a physical and space-mediated relationship to the things of the world (including texts), and … such desire for presence is … the ground on which philology can produce effects of tangibility (and sometimes even the reality thereof)" (p. 6).

University humanities programs today, Gumbrecht (2003) maintains, over-emphasize what Wilhelm Dilthey stands for, namely "the movement from the material – and we may add, the philological – surface of the phenomena to the spiritual depth" as the core of the humanities (Gumbrecht, 2003, p. 76). The argument echoes Walter Benjamin's lament about the loss of aura in technological reproduction, become internet mediation, emphasizing how aesthetic experience "makes present" in concrete encounters that affect a person's physical environment or body.

Gumbrecht's (2004) subsequent *Production of Presence: What Meaning Cannot Convey* is an extended brief for his ontological criticism of literary studies in the technological world. In his view, humanities in the West have been complicit in "a process of progressive abandonment and forgetting of presence." By contrast,

> Some of the "special effects" produced today by the most advanced communication technologies may turn out to be instrumental in reawakening a desire for presence…. Presence effects … exclusively appeal to the senses [so that] the reactions that they provoke have nothing to do with *Einfühlung*, that is, with imagining what is going on in another person's psyche. (Gumbrecht, 2004, p. xv)

Instead, Gumbrecht (2004) seeks to "get [his] hands awfully dirty" in trying "to reach and to think a layer of cultural objects and in our relation to them that is not the layer of meaning" (p. 54).

What then is happening with the love of language in a world in the overwhelming presence of so many things defined by their technicity? The short answer is perhaps both many things – and we do not know.

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Language of Criminalistic Research as a Basis for Studying Criminal Legal Phenomena

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Abstract
This essay for the inaugural issue of *Technology and Language* explores the complicated interrelation of conceptual and technological change in the context of scientific development. It shows how these relations become even more complex in the age of information technologies. Criminalistic research offers a case in point. It is defined by a set of technologies and a precise language which serves to render vague legal concepts determinate. Technology is not only used by law enforcement and the science behind it, it is also used for committing criminal acts. In this case, as criminals learn to draw on the technical vocabulary of the information society, criminalistic science has to develop or refine its vocabulary in order to define and characterize the new kinds of criminal activities. This marks a dialectical moment in the development of contemporary societies.
Keywords: Language of Criminalistic Research; Terminology; Linguistic Concept

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* исследуется сложная взаимосвязь концептуальных и технологических изменений в контексте научного развития. В статье показано, как эти отношения усложняются в век информационных технологий, на примере данных криминалистических исследований. Известно, что криминалистическая экспертиза определяется набором технологий и точным языком, который служит для определения юридических концепций. Технологии используются не только правоохранительными органами для проведения расследования, но и преступными элементами для совершения преступных действий. В связи с этим, криминалистическая наука должна развивать и уточнять свой словарь, чтобы определять новые виды преступной деятельности, которые возникают в информационную эпоху. Этот процесс можно рассматривать как диалектический феномен в развитии современных обществ.

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Linguistic expressions, being an intrinsic element of the human response to the environment, change and transform in the developmental process of societies. They are an embodiment of new scientific knowledge in any sphere of activity. Language is not an invariable system, it reflects the whole range of the human development of various new spheres of knowledge., This includes basic changes in the field of technologies used both for producing wealth and for studying events, processes and phenomena of specific vital activities. Technologies – developing over the course of consecutive stages of the societal progress – absorb all new aspects of various approaches to obtaining new knowledge regarding the most central aspects of human activity. The term "technology" is actively used in forensic science in various combinations, as "technology for solving crimes," "technology for research and collecting traces," "technology of criminal activity," etc. At the same time, the meaning of the concept of "technology" in the framework of forensic research is not unambiguously defined, which gives rise to scientific disputes about the possibility of the existence of many technologies which are insufficiently grounded in science.

The process of developing any technological system is necessarily accompanied by the social process of creating new linguistic concepts for designating technological changes as they occur periodically in the course of historical progress. This can be seen in a neologization of the language of forensic science, when terms appear such as "forensic dermatoglyphics," "forensic holography", "procedural fixation."

Proceeding from this proposition, in order to successfully develop the specific branch of theoretical and applied knowledge, it is important to elaborate the terminological complex including logically formulated conceptual representations. This will allows us to reflect on the concrete results of researching a certain object in different areas, using linguistic expressions with the greatest degree of efficiency. This tendency is clearly exemplified in the field of criminalistic research of criminal actions, phenomena and events. This research makes an essential contribution toward the organization of effective law enforcement and its agencies which counter the various criminal encroachments against human life, health and property, information security, also the ecological balance of environment and human activity. To this end, the concept of "criminalistic model of criminal activity" was formulated and developed on the basis of the concept of "criminalistic characteristics of a crime."

In research that generates ideas about concrete criminalist objects two factors play an essential role. Firstly, there are the technologies applied while studying any given object which is the result of illegal activity. The list of techniques and methods utilized in criminalistic research, which, in general, can be defined as criminalistics technology, secondly requires in certain vital circumstances a developed complex of concepts which precisely describe the essential feature of various phenomena and results of activities with criminal consequences.

Language is a necessary component for the scientific application of criminalistic knowledge and for describing its results. Linguistic concepts used in criminalistic

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research are to be sufficiently accurate and formulated so that they contain no ambiguities, that is the semantic content of terms – which is updated in the course of criminalistic work – is to reflect, most deeply, the essential features and signs, characteristic of a certain object studied. Thereby, the conclusions of criminalistic investigation of a certain object or phenomenon are to correspond to the most important elements which are the contents of scientific inquiry in the field of criminalistic relations.

Criminalistics as one of the leading branches of criminal-legal knowledge has a specific terminology reflecting the features of this scientific discipline object (ballistic examination, fingerprinting, expert conclusion, etc.). Hence, it is possible to propose that for criminalistic research an essential role is played by the conceptual and terminological system allowing us to describe any given criminal-legal phenomenon with sufficient precision. Therefore, forming a developed complex of the concepts which accurately depict concrete research objects is of great importance for consecutively developing criminalistics as a certain area of science-based ideas. The terms used by experts in criminalistics significantly differ from descriptions of these objects, processes, and things used by representatives of other fields of legal knowledge.

In this branch of law, there is a significant tendency to limit the formalization of the linguistic concepts that refer to illegal acts as provided by the criminal legislation of the concrete state. This is how standard terms first appeared in forensic science and forensic examination, such as the operability of a weapon, a standard sample, an intrinsic characteristic, a trace-perceiving object, the production of an examination, expert prevention, and others.

The specificity of terminological designations that are peculiar to this branch of the humanities is that the concepts used by criminalistics are accurate and unable to be extended to descriptions of close or similar processes and phenomena. At the same time, they are often of a composite nature, in particular, the material situation, genetic "fingerprinting," the criterion of identity, odorological examination, identification sign, strangulation groove, individual signs, handwriting degradation, sleeve flange, forensic characteristics, investigative actions and several others.

The originality of technologies of criminalistic character is reflected in the fact that specific questions having a highly probabilistic character are solved with them. Frequently, while applying the most perfect methods of criminalistic technologies the unambiguity of conclusions is attained which forms the basis for indictment after conducting preliminary investigations into the most difficult criminal cases. Accuracy of the formulations used, their association with the applied techniques and methods of scientific and criminalist approach, allows us to describe difficult phenomena of criminal-legal reality as interconnected system manifestations of subjectivity and objectivity which are present in criminal acts.

Alongside with the development of advanced technologies which are widely applied in conducting criminalistic actions, there is an improvement of scientific knowledge also in respect to the linguistic expressions. Linguistic terminology absorbs not only features of the research object in a particular scientific discipline, but it visually turns into reality those intrinsic elements of new achievements of criminalistics where the development of scientific ideas concerns the new types of criminal acts that happen in the context of a rapidly developing information society.

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Introducing new linguistic concepts and designations allows researchers and experts of criminalistics to address the variety of human activity in the contemporary world.

Terminological aspects of criminalistic research cannot keep us from using the most modern technology and methods of research in the field of crime fighting and prevention. This problem is closely connected with the processes of change in the sphere of language and, at the same time, with related transformations in the field of technologies.

In the 21st century, it should be noted that such circumstance as the steady expansion of using the latest information technologies for committing criminal acts is investigated to clarify the essential features of these illegal. This tendency demands the improvement and specification of many criminalistic terms in order to use them for describing criminal activities and, thereby, promote the efficiency of law enforcement agencies. If one takes criminalistic researches of the late 20th century and the contemporary time period, there is an evident tendency towards complexity of terms used in most different activities of society, including the criminal actions directed against the individual or the state. This tendency leads to the demand that experts in the sphere of the advanced technologies that are used by criminalistics should be able to formulate a number of new terms and designations which allow us to specifically define whether a socially dangerous act is criminal and constitutes considerable danger to the interests protected by the law. The development of advanced information technologies challenges researchers and practical workers in the field of criminalistics to adequately designate applied methods and their production of significant results that can be used by bodies of preliminary investigation and the courts when they consider criminal cases of different categories. However, not only this direction is obviously important in the sphere of developing criminalistic researches. There is a valuable use of criminalistic knowledge with its terms and linguistic expressions also for the purpose of objectively formulating the conclusions which can demonstrate violations of property rights of different subjects in the course of economic activity. That is the information, obtained as a result of applying criminalistic technologies with the use of specific linguistic expressions, is able to form the sufficient basis for settlement of disputes between economic entities and their successful consideration by arbitration courts. For example, in connection with the development of technology, some authors propose the use of computer modeling in forensic research and the consolidation of such a means of obtaining evidence in procedural regulatory legal acts.

The problem of expanding and developing the volume and list of linguistic concepts used in criminalistic researches has a multi-sided character as it reflects the diversity of the research object in this scientific discipline. The technology of developing criminalistic methods entails the scientific introduction of new terms and expressions which allow to specifically designate to the utmost the phenomena and processes relating to criminalistics in the contemporary world. The improvement of terminology and clarification of fresh conceptual wordings allows us to raise the degree of conclusion-validity while considering various results of activities of individuals, entities and public authorities. There is thus the very important circumstance of a dialectic interrelation between specifics of actions of society members and the formation of scientifically based concepts which reflect intrinsic elements of different processes that occur in the criminal

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sphere of societal activity and in other areas of active human influence upon the world around us.

Linguistic concepts fix and give a settled character to those innovations which are constantly present at the course of researching realities of the world around and results of human impact on various objects and phenomena.

It is important to compare scientific ideas embodied in linguistic concepts and objective knowledge of the reality surrounding the person and the changes that occur during any given time period within single states and the world in general. Language improvement is the process caused by the growth of scientific ideas in most the important directions of social development. This process is interconnected with transformations in concrete areas of scientific knowledge and substantially reflects achievements of certain scientific disciplines in forming ideas of their research object.

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Technology as Semiosis

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Abstract

This essay for the inaugural issue of *Technology and Language* develops a systematic conception of technology, both as the human way of being in the world and in its historical development. As such it continues a line of thought that was initiated by Ernst Kapp and Peter Engelmeyer – but does so from the point of view of contemporary philosophies of technology and language. Technology is presented as projective semiosis that works on the level of ideas, rules (including the laws of nature), and material or ontology, leading to the creation of artificial environments and finally to a second or third nature.

Keywords: Projective Semiosis; Semiotics of technology; Problem of the New; the Artificial; Triact

Аннотация

Данное эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* развивает систематическую концепцию технологии как способа существования человека в мире, и в качестве исторического развития. Таким образом, оно продолжает линию мысли, начатую Эрнстом Каппом и Петром Энгельмейером, но делает это с точки зрения современных философий технологии и языка. Технология представлена как проективный семиозис, работающий на уровне идей, правил (включая законы природы) и материи или онтологии, приводя к созданию искусственных сред и в итоге ко второй или третьей природе.

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Technology as Semiosis

Every individual deals with signs, with their production, naming, accounting, interpretation, application, and habitation. Natural and super-natural, natural and artificial sign systems constitute the foundations of knowledge, reasoning, and action. The rules that persons extract from the environment, from their own consciousness, from revelation, are the rules for distinguishing the sign and the unfamiliar, building the hierarchies of layers and stages of reality, for designating notions through systemic meanings, combining meanings in various systems. Participation in the processes of signing is a fundamental property of life: this or that subject, including human and non-human, a natural or artificial actor of life processes, is alive to the extent that it participates in semiotic processes, creating them and managing them.

Technology in its broadest sense – as the ability of an individual to understand and to change reality – is the most complete expression of the semiotic nature of life. Technology as a phenomenon, a set of artifacts, a medium and form of activity, a way of development, allows us to clearly identify and formulate the pragmatic, syntactic and semantic rules of refined semiosis – the language of the universe – in the substrata of which the processes of human activity run. This essay argues seven theses about technology in the context of semiotic ontology: 1) technology is a projective vector of knowledge, a vector of activity opposed to receptivity; 2) technology implies problem-solving, a new product; 3) technology is creation, creativity and co-creation; 4) technology is the detection and shift of boundaries between the conceivable and the actually possible; 5) technology is the application and modification of rules; 6) technology reveals itself in techniques; 7) technology invents and upholds the living environment.

COGNITION AND ACTIVITY. STAGES OF REPRESENTATION

A person, and apparently every kind of subject that a person can imagine, is engaged in knowledge, reflection, and action. Since classical antiquity, the two basic vectors of human manifestation in the world have been defined *as understanding* and *expression*, mediated by reflection. Peter K. Engelmeyer (2010), a major Russian philosopher of technology, begins his "Theory of Creativity" with the separation of subjectivizing and objectifying activities: the situations in which a person extracts knowledge from reality, and situations in which a person uses the extracted knowledge to change reality (p. 18). Psychologists study these situations in the models of internalization and exteriorization of knowledge.

The situation of cognition looks like this: a person as a subject learns to know in transcendental or biologically mediated forms independent *reality* or existence as it is, forming in the acts of cognition an image or a complex multi-layered picture of the universe, that is, *the actual* or being. The amazing feature of the human species is that the reality created in the acts of knowledge is historically variable. In the most banal example, the reality of the myth does not coincide with the reality of science or Christianity, and in general, we learn about the real from the violation of expectations regarding reality.

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This variability happens because reality itself, as the subject knows or sees it, is the product of objectifying activity: it is not created by the act of *perception*, but by the act of *projection*. The situation of expression, objectification, exteriorization, projection, or, generally, activity as such (if the concept of activity is opposed to the concept of knowledge) is actually the original and most general situation of technology.

Cognition is a complex step-by-step process. After Nicholas of Cusa, German classical philosophy, German and Russian neo-Hegelianism and neo-Kantianism – which in many ways gave rise to the philosophy of technology – we distinguish in the process of knowledge the stages of sensory perception, mind and reason. Each of these stages of representation of reality is described by a semiotic substratum, specific only for it, and by a set of semantic, syntactic and pragmatic rules. Reality is fixed by sense as an *object* of physical and chemical nature, by mind as a *subject* of logical and grammatical nature, and by reason as an imaginative *phantasm* or a strictly defined *concept* extracted from one or another version of Plato's world of ideas or from the depths of individual and collective consciousness. Reality is a clearly or vaguely reflected interaction of an object, subject, and concept (phantasm).

Technology in its original and most general sense is a *projection*, that is, a change in the order of the stages of representation. A fantasm or concept is realized in a subject of natural language or in a system of rational categories and is superimposed on the data received from the sense organs. Cognition as "the transformation of being into an object" and "the objectification of being into a subject" is in terms of logic described by the procedure of inductive generalization, technology as "all action outward" is defined by the procedure of deduction as "the interpretation of facts in the light of a theory." The first technical act, unconsciously performed by a person (subject), is an act of reflective construction of reality, implicitly including the ontology. The procedures of the subject's development are determined by awareness and purposeful use of the rules extracted from this act, thus they are technical procedures.

A PROBLEM OF THE NEW

Technology deals with novelty, starting from the first act of consciousness: the actual as such does not exist in known reality; it is contained only in the subjective reality of an individual and is historically transmitted by the collective cultural experience. "The actual" is the first result of the re-definition of reality by technology.

After Hegel, the new is defined through the violation of a subject’s expectations as a mismatch between the actual and the real, and represents a certain shift of the boundaries of an object, subject, or concept in individual or collective consciousness. The source of the new is the problem that arises in situations of understanding and expression and is fixed by reflection.

In case of misunderstanding, the very notion of the problem fixes in semantic terms the inability of the subject to move from the sign to its meaning, in syntactic terms – the failure to include the sign in the combination of signs, find an alphabet or a rule of inference, the inability to distinguish between the sign and the context. At the same time, a misunderstanding occurs in the semiosis of sense perception, in the semiosis of mind, and in the semiosis of reason. In case of ineffability, the notion of the problem captures semantically the failure to find a sign for the current object, fantasm or concept,

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syntactically – the inability to create the desired sequence of signs, to build a sentence, pragmatically – the failure to find the necessary interpretant, the skill of distinguishing system and environment.

In general, the problem arises as a result of an overlap of representation systems in such a way that there is an incompleteness or uncertainty in the subject's reality, which then sets the task of filling in the "places of uncertainty." This process is described in all branches of learning, including the philosophy of technology as the process of creating needs, desires, managing attention, creating interest or commercial demand. The problem, understood as a need or an experience of incompleteness, entails a conscious transformation of reality by the subject, making the being appropriate, and requires a solution as a transition from reception to action that changes the state of things.

The new is the solution of the problem, the shift of certain boundaries at a particular stage of consciousness. In Plato's world, the solution is extracted by an individual from the world of ideas. Friedrich Dessauer, a major German philosopher of technology, called it the "Fourth Kingdom" or an invention. Access to the "preset form of solution," comprising the epistemic novelty of the problem solution, is determined by experience, knowledge of the rules: The invention is the only possible form of filling the place of uncertainty which is caused by obvious and hidden, historical and social preconditions of the way the problem was set which caused this uncertainty. The total sum of solutions to the problems that constitute human reality is the *actual cosmos*, in other words, a fragment of reality accessible to humans, where their theories are verified. The total sum of actual and speculative violations of expectations in problem-solving procedures constitutes a fragment of reality where theories are falsified, allowing us to infer an epistemically infinite *potential cosmos* as a reality containing new, but not yet available solutions (Dessauer, 1956).

The ontological distinction between the actual and the real, the actual and the potential cosmos allows us to justify the category of the new (as a transformation of a historically specific rule of semiosis) in terms of epistemology – and in terms of a theory of action that links it to the historical process of comprehending and applying the rules of semiosis of perception, mind and reason.

STAGES OF CREATIVITY

The very transition from reception to projection is called intuition. A significant difficulty in describing intuition is that the semiotic circle of activity at any given time includes both receptive and projective processes: the selection of the very moment of transition is due to the skills of conscious management of reflection and in different contexts of the world is fixed by different concepts – from "revelation" as direct knowledge to "decision-making" by the expert council in modern management theory. The transition from knowledge to action in the study of technology is interesting in two aspects. The first is related to the awareness of the mechanisms of consciousness in this process, the theory of knowledge in this regard distinguishes three types of intuition (sensory, intellectual, and rational, or mystical). The second aspect is related to the source

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of the integrity (ontology) that underlies every action – technical action tends to avoid ontologies that are not expressed in a particular sum of semiotic rules.

A projection as such, technology in the general sense, the creative process is carried out in three stages. Engelmeyer (2010) combined them in the concept of "triact," which includes idea, construction and execution (p. 103). Dessauer (1956) has used the concept of three human formative forces to describe them: homo investigator, homo inventor, and homo faber.

The "idea", or "homo investigator" marks the stage of reflective reason (*intellectus*, *Vernunft*), where the solution occurs as a shift of pragmatic rule (the correlation between an environment and a system, a context and a sign), a shift of syntactic rule (the combination of ideas, concepts, fantasms, images), a shift of the semantic rules (the formation of a new content of idea, image, etc.). The novelty of the "idea" as a sign of reason, as a rule, is associated with the transformation of the boundary of the conceivable, with a change in the structure of the subject's reflection.

The "construction" or "homo inventor" marks the stage of mind (*ratio, Verstand*), connected in the historical and philosophical tradition with the category of expression. The new from the point of view of pragmatics is realized as a shift in the possibilities of language style, a discovery of intersubjective language in the context of non-linguistic (individual) states. The new in syntactics is created by the methods of combining elements and new combinations fixed by rhetoric, logic, artificial mathematical languages. The new in semantics is related to a change in the interaction of the systems of notation and denotatum.

The "execution", or "homo faber" is the stage of embodiment in the substrate of the material, expressed in the physical and chemical interactions of semiosis. Pragmatically, the new appears as a shift in the possibilities of material embodiment, syntactically it appears as the discovery of new ways of interacting of the material elements, and semantically it appears as the creation of artifacts perceived by a subject on the same plane and forming a series with natural objects.

Creativity as the production of the new is the quintessence of projection, or technology in the general sense. Identifying the stages of implementation of an idea, the rules that were updated or transformed in this process, allows us to separate the complete and incomplete technical objects, to fix the areas where tasks are performed by one or another object.

(UN)CONCEIVABLE AND (IM)POSSIBLE

Technology is a projective semiosis that connects reason, mind, and sense perception in the act of solving a problem. The result of this act is an artificial object of perception, an artificial object of mind, or an artificial concept of reason, an artificial phantasm that performs its functions to change the fragment of reality in which the problem has arisen. The task assigned to artifacts is to change the way the systems of consciousness interact to transform the reality according to a particular model.

Technology reveals the objectivity of the rules of reflection, allowing the potential (unconscious, natural) to be realized in the actual (conscious, artificial). The conceivability of any idea or language construction does not guarantee the possibility of its implementation in the substratum of the physical world, and the unthinkability and

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unrepresentability of a material or linguistic syntactic interaction does not imply their impossibility in the real world.

There is a well-known epistemological scheme that allows us to distinguish four situations of knowledge: ignorance about ignorance (pre-problem situation), ignorance about knowledge, knowledge about ignorance (problem situation), and knowledge about knowledge (Dubrovsky, 1994). The praxiological scheme, which makes it possible to distinguish the situations of action in a simple binary model, identifies the conceivable (representable, known) with the possible (feasible, realized due to compliance with the objective rules of semiosis implementation). The four situations of action include unconceivable and impossible (pre-problem situation), unconceivable and possible, conceivable and impossible (problem situation), conceivable and possible.

A DISCOVERY OF SUBJECTIVITY. AN EXAMPLE OF MAGIC

Technology as a projective semiosis generally includes all forms of interaction between a human and reality. The narrowing of the concept of technology is preconditioned by the consistent discovery of objectively existing rules or laws that govern every manifestation of life. George Berkeley liberated rationalism from solipsism by a simple definition of existence, demonstrating the objectivity of observation structures relative to any possible observer. In the philosophy of technology, this kind of history is connected with the arguments of Ernst Cassirer addressed to James George Frazer and answering the question why technology is not magic.

Cassirer's argument is simple: the subjects of magical activity (regardless of whether they “tell fortunes” or “conjure”) do not know themselves as a source of problems, nor do they know the “cosmos” as a partner for dialogue – this is not a subject who constructs the actual against the background of super-complex reality. In contrast, the subjects of technical activity, proceeding from the situation of measuring experiment, reasonable questioning of nature, know themselves as persons acting under an objective law of nature in accordance with the objective restrictions imposed on them by this knowledge (Cassirer, 1985).

The projective semiosis is realized by a person in the process of an activity that adopts as its form the reality (immutability) of rules. Technology in a narrow sense can be defined as a set of semiotic rules of consciousness which the subject is aware of, as a language of reflection that is reflected at a particular historical stage of development as a sphere of the fulfilment of desires and solutions to problems. The technical inventions that create new forms of reality arise, historically, in the substratum of the physical world (from the wheel and sail to the blade of a turbine), in the substratum of the mind (from natural languages, art of counting, rhythm and meter to expert systems, and automatic translation programs), and in the substratum of the reason. Ivan Lapshin (1999) calls the reasonable (intellectual) inventions the latest inventions of humankind, which sets the forms of reflection of the spirit –this is an aphorism, this a dialogue, and this a system (p. 163-164).

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THE TIME FOR CREATION

Generally, technology is present where a person undertakes to solve certain problems and, making mistakes, achieves results in the form of new artificial objects, objects or concepts that complement problematic situations and resolve them with this addition. In a narrow sense, the technology as a form of activity arises together with the concept of dialogue with nature and unfolds as a system of changing the human environment. The aphoristic craft *téchn*e is dialogically revealed as "the art of evoking the desirable phenomena of nature" and systemically as "a force that is changing the face of the world." Art as the ability to act according to Aristotle's rule, as "that in relation to which there are rules, the combinatorial application of which is no longer regulated by rules" (Schleiermacher, 1984, p. 1273), unfolds as the scope of application of the rules of constructing reality in order to change reality (first locally, and then globally).

In common sense, technology is understood as a set of man-made artifacts. In philosophical reflection the artificial objects are exposing themselves as the fulfillment of the semantic rules of projective semiosis that is possible to the extent how deep is the correlation of the real and the actual available to a person at a particular historical time and how clearly the syntactic rules of the physical world are defined. From the correlation of common sense and philosophical reflection, it is clear that technology reveals itself in collective consciousness as a technology in analogy to the conclusions of logic: just as a certain syntactic combination of signs in a natural or mathematical language gives a guaranteed truthful judgment, so a certain combination of elements in the physical world gives a guaranteed result in the form of the expected solution of the problem. Technology is revealed in a particular technical system or technique as "a resultant of the efforts of man and Nature" (Lem, 1964/2005, p. 62) – in technical objects a resultant in time or in such algorithms that allow obtaining a given meaning of a sign by way of recombining syntactic elements in the substrate of the physical world.

NEW ARTIFICIAL NATURE

Technologies – the machines that work to transform energy in space and time of the physical world and to transform information in the realms of mind and reason – create a history of interaction between the natural and artificial. "Nature" as a natural integrity, in which humans continue to partake, is found in acts of knowing, that is, in the form of knowledge about immutable natural-scientific, logical-grammatical and intellectual rules verified by technology. In the forms of activity, nature presents itself as a medium and a condition for the possibility of applying knowledge to solve technical problems.

There is also a sense in which humans are not a part of nature, not only because of the Marxist and anti-Darwinian thesis that we do not adapt to the environment, but adapt the environment to ourselves, but also because of the Hegelian and Luhmannian thesis that a projective activity is forced to consider as the environment (initial chaos, noise, background, context) a particular model of its own natural form. The system of activity that generates the artificial is built within the boundaries of the natural system, so that we learn about the latter only through its reflexive – receptive or projective – models. Christianity and the ontological models of absolute idealism in general eliminate the emerging complexity through the concepts of "the seventh day of creation" and "divine

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co-creation", but, nevertheless, everything natural is known through the artificial and everything artificial is born from the natural.

The opposition between the artificial and the natural indicates that the artificial is a fragment or some particular approximation to the natural, in technology consciously used by humans in their reality, built on the basis of rational knowledge or tradition. The logic of development requires that the artificial coincides in its boundaries with the natural (the system in its complexity must coincide with the environment in order to reach a new level of opposition) and surpasses its capabilities, technically revealing really new, supernatural forms, methods and mechanisms of knowledge and activity. This is a Hegelian model, which is also reflected in the current development of technologies (NBIC-convergence and nature-like technologies). "How do you understand the superiority? [of artificial over natural – A. N.] ... it means the realization by Nature of what is impossible for Nature" (Lem, 1964/2005, p. 256).

The first artificial nature arises in the form of the human life environment created by the artifacts and technologies in the physical world. Technology produces new physical objects, each of them characterized by a changed (relative to the natural) order of its constituent elements. The increase in the number of unnatural objects leads to a change in the quality of perceived reality and forms the first unnatural environment. The first artificial nature is made up of projective versions of the semantic rule of sense perception, designed to solve the problems formulated for the natural, unchanged layers of human mind and reason; its qualitative development is associated with the change of the pragmatic rule of perception by scientific progress and the use of newly discovered syntactic combinations (for example, from the microcosm in convergent technologies) to create new artificial objects.

The second artificial nature has appeared together with cybernetics, when the skills of managing the pragmatic rule of reason were transformed from individual *téchn*e into technologies. It is characterized by the spread of artificial objects in the sphere of the mind, creating a changed order of elements, where the new systems are no longer in the sphere of perception, but in the sphere of logical and grammatical forms of thinking, reasoning and construction. In the dialectics of artificial and natural for machines that process information, the background is the first artificial nature – and the new complex system they create is unfolding as a secondary semiological system that builds itself on the physical reality of artifacts. Further development of artificial nature leads to the appearance of the third artificial nature, in which the artificial, technically created concepts and systems of concepts, that is, the mechanisms of reflexive control, are added to artificial objects and subjects (Nesterov, 2017). Some steps in this direction are made by transhumanism, which moves the point of application of technologies inside the human and the living organism as a whole – but the most noticeable results are obtained in the development of decision support systems in approaching the concept of a powerful AI. We can say with a high degree of confidence that humanity is already dealing with a third artificial nature, since artificial actors have appeared in society (and their number and types are increasing), making decisions that are significant for humans, using non-human forms of reflection, performing ontologies that are not transparent to a human.

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PROBLEMS AND CONCLUSIONS

Technology is the control of matter, where matter is the substrate of semiosis. Technology is a language, a complex interaction of pragmatic, syntactic and semantic rules of activity. Technology is a tool for liberation of the human mind from the influence of biological limitations. Technology is a force that creates new forms of nature, new images of a human being and life.

The state of technology at each moment of time clearly shows the level of development and self-knowledge of a society, the material form of culture, which fixes the ratio of actual and potential cosmos, the real and the actual, conceivable and possible in specific historical conditions. The mechanisms of development are set by the vertical logic of technology, which determines the auto-communicative self-determination of humanity as a species.

The global problems raised by modern philosophy of technology include 1) the separation of ethics and technology: humanity employs the systems of moral norms of archaic tradition and axial time, the ways of "being human" are fixed for the conditions of life of natural and the first artificial nature; however, there are no systems of proper ethical regulation for the age of cybernetics; 2) the construction of human technical evolution under the conditions of the third artificial nature, the digital revolution, or the "technological singularity" in the sense of Vernor Vinge. The various concepts of cyborgization, of the neo-human, of automation of the social processes all require understanding and development of the reflexive nature of technology. They require the integration of an awareness of semiosis in the development of models and model ontologies. With this awareness philosophers and engineers can evaluate themselves, technology, and their designs on and of the future.

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Non-Technological Narratives about Technology in Russian Science Fiction

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Abstract
This essay for the inaugural issue of *Technology and Language* discusses Russian science fiction and utopias where technological devices and systems become active agents of the story, providing a perspective for treating social and political problems. Three major periods are covered in broad brushstrokes – the turn of the twentieth century when the industrial production went hand in hand with techno-optimism; the 1960s-1970s which were the Golden Era of Soviet science fiction, reflecting on technological achievements and social and ethical dimensions of technology; and post-Soviet literature that turns to dystopian and utopian narratives of socio-technical development. Throughout, science fiction was a venue for formulating national identity, reasoning on the essence of progress and coping with historical experience. As such, the literary imagination about technology was not technological at all, but was grounded in ideology and social concerns or identity, which assimilates technology to language and culture.

Keywords: Science Fiction; Utopia; Discourse; Representation of Technology; Progress; National Identity; Cosmism

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* обсуждаются российская научная фантастика и утопии, в которых технологические устройства и системы становятся активными агентами истории, обеспечивая перспективу для решения социальных и политических проблем. Рассматриваются три основных периода: начало двадцатого века, когда промышленное производство шло рука об руку с техно-оптимизмом; 1960-1970-е годы – золотая эра советской научной фантастики, отражающей технологические достижения и социальные и этические аспекты технологий; постсоветская литература, обращающаяся к антиутопическим и утопическим рассказам о социально-техническом развитии. На протяжении всего времени научная фантастика была площадкой для формулирования национальной идентичности, рассуждений о сущности прогресса и исторического опыта. Таким образом, литературное воображаемое о технологии совсем не технологично, но сосредоточено на идеологии, социальных проблемах и идентичности.

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Non-Technological Narratives about Technology in Russian Science Fiction

I suggest looking at literary texts as representations of our relation to and experience of technology. An example of this can be found in Russian novels and stories featuring advanced and futuristic technologies that play an important part in the plot – they influence the ways societies are organized, and the way people relate to each other and to the world. These texts include science fiction (involving plausible scientific premises), utopias, speculative fiction and even mystical stories where technology becomes an important actor. I will cover in broad brushstrokes various periods in which such literature flourished in Russian culture: the turn of the twentieth century when industrial production was affiliated with techno-optimism; the 1960s to 1970s which were the Golden Era of Soviet science fiction reflecting technological achievements and social and ethical dimensions of technology; and post-Soviet literature that turns to dystopian and utopian narratives of socio-technical development. In these works, technological devices and systems are not only accessories or stage props, but active agents of the story. They simultaneously provide a perspective for addressing social and political problems and raise concerns about the future and the social order. The plausibility of technologies and accuracy of forecasts are not really important here, what matters is the context in which technology is placed, how it is described and which fears, hopes, concerns are associated with it. This can reveal how science and utopian fiction discursively constitute technology, and what larger societal issues are exposed through technology.

Science fiction became popular in Russia at the end of the nineteenth century. Although the quantity of texts never reached the level of American and British sci-fi literature, one can nevertheless observe a salient interest among Russian writers and readers in this genre. For the societies of the future or of distant lands that were described in literature, the novel technologies of energy, transport and communication did not only increase comfort, but helped improve the morale and the nature of social bonds (Nikiforova, 2017). These discussions of technology as a means for social perfection were unfolding against the background of the debate between Slavophiles and Westernizers about the right way for Russia. Literary works reflected what kind of progress there could be specifically for Russia and how it might reconcile science and religion. According to the Slavophiles' vision, devotion to tradition and religious values would allow for a harmonious and socially appropriate development of technology and industry (see the sci-fi novels by Alexander Krasnitsky, Vladimir Odoevsky, Sergei Sharapov, Nikolai Shelonsky).

There were texts that developed the idea of an alternative, non-Western technological progress. They played with the geographical position of Russia between West and East – and speculated on how different communities could relate to westernization or colonization. Europeanisation and modernization were represented as something negative and unwanted (Leonid Afanasiev "Trip to Mars", 1901). European hegemony could be questioned as well ("Andre's Diary. Trip on balloon to the North pole", anonymous short novel-mystification, 1897). In Alexander Bogdanov's "Red Star" (1908) Earth-Mars relations reproduce the ideological confrontation between Russia and

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the West. The discussion about youth, barbarity and colossal possibilities of the Earth in comparison to the quiet old age of Mars finds a parallel in a similar opposition of Russia and Europe in the Slavophile tradition.

Philosophical reflection on space and space travel was developed within the framework of the tradition of so-called Cosmism. Nikolai Fedorov (1829-1903) is considered to be the originator of Cosmist thinking. He conceived of the philosophy of the common task: According to him, all of mankind should unite and concentrate on "the common task" of resurrecting the dead through scientific means and accommodating them on other planets. This idea conflated spiritual salvation and scientific rationalism calling upon the religious idea of resurrection and liberation from death together with the creation of a global brotherhood. Both missions, according to Fedorov, are enabled by technological solutions such as interstellar flying machines or a gigantic electrical apparatus that is capable of controlling the climate on Earth. Space narratives originating from cosmist thinking were a peculiar combination of orthodox thinking, utopian futurist visions and scientific rationality. Konstantin Tsiolkovsky – who is considered the "grandfather" of the Soviet space program – was a follower of Fedorov and shared his ethical and messianic ideas.

Soviet science fiction flourished especially during the Thaw from the mid-1950s to mid-1960s. Here, the most important names are Ivan Efremov, Kir Bulychev, Alexander Kazantsev, Arkady and Boris Strugatsky. It was a period of hope for changes in political and social life, and the easing of censorship. All this gave way to the ideas of a variability of the future of the USSR and of the whole of humanity. At this point sci-fi became a genre in which it was possible to reflect on historical trauma, the experience of Stalinism, purges, and Civil war. Compositional techniques in science fiction allowed Soviet authors to encode the themes that otherwise would not have been possible with literature being subject to censorship. At the same time, Soviet science fiction echoed global concerns about the limits of industrial development.

Internationally known as cult sci-fi authors were the brothers Arkady and Boris Strugatsky. Their prose is deep and philosophical, and it questions technological progress and the moral issues of transforming human nature. In their novels, advanced technology – shown as harsh and oppressive in "Inhabited Island" (written in 1969) or harmonious and humane in the Noon Universe series – helps disclose the authors' concerns about the essence of technological optimism and the nature of human-technology relations. At the same time, Strugatskys' science fiction is a sort of reflexive prose that rethinks the tenets of Enlightenment and reasons about political regimes of the twentieth century (Kukulin, 2007).

Post-Soviet science fiction and futuristic fantasies question the ideals of contemporary civilization which is focused on information and communication technology and on biotechnology (for instance, "iPhuck 10" written in 2017 by Viktor Pelevin). They often focus on the problems of Russian identity, of political history and ideological orientation. There are utopian narratives that are built around a return to traditionalism. Mikhail Suslov and Per-Arne Bodin note that "conservative utopianism" became a distinctive feature connecting post-Soviet speculative fiction with nineteenth century Slavophile-inspired tradition. They sum up utopian narratives that are considered to be important components of Russian identity. These involve as a historical legacy the

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greatness of Soviet superpower with its technological achievements and messianic strivings. They also involve specifically Russian values, ideology and tradition which keep standing in contrast to the "Western civilization." Finally they concern Russian culture (language and religion), Russian territory and its qualities as Euroasian "heartland" (Suslov, & Bodin, 2019, p. 9). Again, science fiction is used as a channel to reflect on historical events and to overcome historical trauma such as the fall of the USSR. It is manifested in a whole genre of alternative histories (Alexander Golodny, Andrey Lazarchuk, Artem Rybakov, Mikhail Uspensky).

Thus, in the history of Russian science fiction we observe a variety of roles that science and technology can play. According to Foucault, discourse reveals power relations in society as expressed through language and practices. In this Foucauldian sense, technology itself becomes a discourse in speculative fiction. Representations of technology address the questions of inclusion and exclusion of various groups in decision making about technological and social development. They define strategies of social organization, they manifest political and cultural ideals. In this way, literary imagination about technology is not technological at all, but is grounded in/focused on ideology, social concerns, or identity. This brings technology close to language and culture.

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The Grammar of Things

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Abstract
This essay for the inaugural issue of *Technology and Language* programmatically proposes that „technology“ and „language“ are two sides of the same coin and that one cannot talk about one without the other. Everyone agrees that technology cannot be defined as the application of science to the engineering of specific devices. Instead, it includes all the ways in which *homo faber* has always worked to transform the naturally given world into a technosphere. And everyone agrees that language cannot be discussed without consideration of the technical media and communicative practices that make up an infosphere. And yet, our traditional ways of thinking make it difficult to treat language as a kind of technology and technology as a kind of language. Once the obstacles are removed, however, multiple research perspectives open up for linguistics, philosophy, cultural studies, and engineering. These can theoretically illuminate and practically contribute to our lives in a socio-technically multilingual world.

Keywords: Philosophy of technology; Philosophy of multilingualism; Composition; Working knowledge

Аннотация
В этом эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* программно заявляется, что “технология” и “язык” – это две стороны одной медали, которые неотделимы друг от друга. Не подлежит сомнению, что технологию нельзя рассматривать как применение науки для разработки конкретных устройств. Технология включает в себя все способы, которые использовал *homo faber* для преобразования первозданного мира в техносферу. В свою очередь, язык не может обсуждаться без учета технических средств массовой информации и коммуникативных практик, составляющих инфосферу. Однако, наше традиционное мышление мешает рассматривать язык как разновидность технологии, а технологию как разновидность языка. Между тем, как только это препятствие устраняется, перед лингвистикой, философией, культурологией и инженерией открывается множество исследовательских перспектив, которые могут внести теоретический и практический вклад в социально-техническое обустройство нашего многоязычного мира

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The tradition of Western philosophy and the many people who grew up within this tradition, tend to divide the world into separate spheres. These spheres interact with one another, they are complementary, but most of all, they are totally different. In this tradition, technology belongs to one of these spheres, language to the other. They cannot be united simply by placing an „and“ between them.

This is what we tend to say: It is one thing to talk and think, to learn and write, to express ideas – and quite another thing to build and make, to construct and design, to create material devices. In the division between head and hand, between mind and matter, language belongs to the former and inhabits the sphere of ideas. Philosophical commonplace assigns the work of the hand – the „manipulation“ of matter – to the other sphere of technical practice.

Technology and Language defies this tradition by exploring their interactions in many fields – teaching and communication, scientific research and artistic creation, typography and semiotics, engineering education and digital humanities, multilingualism and science fiction. It is also the place to reflect fundamentally on technology as language and on language as technology. Indeed, it may well turn out that they are like Siamese twins or two sides of the same coin, and that one cannot be considered without the other. This is what I want to argue here.

I. „TECHNOLOGY“

What is technology? There are many ways of defining it. Some of these ways keep technology separate from the sphere of mind and language, others exhibit their symbiotic relation. There is no right and wrong as we compare definitions, but some may prove more productive than others.

According to one family of definitions technology concerns our ways of effecting things in the world – technology has to do with means and ends and „instrumental rationality.“ On this account, there can be a technical employment of language especially in the rhetorics of persuasion and the many ways of manipulating people through a clever choice of words. But there are many uses of language which appear to have nothing at all to do with purposes and calculated effects, means and ends. For example, the languages of truth and expressive beauty, story-telling and love-making do not appear instrumental at all or only at second glance.

Another family of definitions associates technology with the creative process, thus with the poietic activity of bringing things forth, of making, weaving, sculpting, shaping, moulding, and building. Again, there are some uses of language that accord with this, many others do not. This account emphasizes that we use language to conjure the imagination, to build worlds, and to create the concepts and categories by which we bring phenomena to light. At the same time, language provides the frame of reference that allows us to formulate theories which describe or represent features of the world. We can agree on our shared reality when language is not used creatively but when it secures a form of life and system of knowledge.

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Both definitions of technology fall short not only by fortifying the division of spheres and by excluding most of linguistic practice. They fall short also in regard to technology. There are many technologies that do not satisfy means-end relations, that are not purposeful and efficient, but pleasurably wasteful – fireworks and fountains, for example, and many machines that perform mostly for our pleasure. Also, technology is not just about making and building an artificial second nature or humanly built world, it also involves rituals of use, protocols and procedures that sustain our ways of life.

Perhaps, then, we can define technology in a more comprehensive way (Nordmann, 2015): Technology is our way of relating to things, it is how we organize or pattern the material world – it is interested in what effects things can produce. As such, technology is akin to language, because language is our way of relating to people, it is how we organize or pattern social interactions – it is interested in what actions people perform with words. To be sure, often we use technology when we relate to other people by way of language – the technologies of the word, of print, of persuasion. The language of the law, for example, appears to be a technology as much as a language. Also, often we use language and involve other people when we relate to things by way of technology – the language of programming, of training, of maintenance. The technology of traffic control, for example, appears to be a language as much as a technology. And so we might say that language is a kind of technology in that it co-ordinates people, their words and actions, even their thoughts and habits of mind. And technology is a kind of language in that it makes things significant in what they can do and how they express their powers.

II. THE GRAMMAR OF THINGS

Let's hold on to this. Technology is how we relate to things, and as such it is a language of sorts through which we know the world.

How do we, how can we know the world? This is one of the oldest and most basic questions of philosophy. Over the course of time, and especially in the time since Kant and in the philosophy of Wittgenstein, a consensus emerged according to which we do not and cannot know the things directly, we know only how they appear to us. How a thing appears to us is a fact: It is a fact that water looks transparent. It is another fact that it has a temperature of 32 degrees Celsius, and another one that it freezes at 0 degrees Celsius, that it has no particular taste or smell, that it quenches thirst. We know what water is by all the facts about water. And this is how we know the world as a world of facts. Now, to the fact corresponds the sentence or proposition. The sentence captures, records, says that water is transparent, that it freezes at 0 degree Celsius and so on. As Wittgenstein pointed out, as Heidegger noted as well – according to our modern philosophical tradition we know not things but how things appear in our linguistic records of our experiences, in our statements of how things appear to us (Wittgenstein, 1922; Heidegger, 1967).

Surely, this is not the only way of knowing the world and knowing the things in the world. We know it not just by stating how things appear to us, we know it also by physically intervening in the world and by creating occasions in which the things can show what they can do. In a hydro-electric dam, water can demonstrate its power, quite literally. In pharmaceutical solutions water shows that it can keep certain kinds of

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chemicals in suspension. In a French press boiling water shows that it can prompt the release of flavor from ground coffee beans. In an envisioned hydrogen economy of the future, water is expected to show how it can store energy in hitherto unknown ways – perhaps it can function like a hydrogen-battery. Again, we do not know the things directly. An experimental system or technical device or socio-technical infrastructure provides a setting, in which things can effect other things and produce a specific performance. It was Francis Bacon in the early 17th century who pointed out that we know the world not simply by contemplation but by creating works in which the things exhibit their powers (Bacon, 1620/1902).

And thus we arrive at the grammar of things (Nordmann, 2018). A sentence, statement, or proposition is a linguistic structure which can express a fact and how a thing appears to us. A clockwork, waterwork, or steelwork also provides a structure in which things can express themselves – where they reveal not what they are or how they appear, but what they can do or effect in concert with other things. An experimental system, a machine, a programmed circuit of electrical switches, a management structure of work flows – each of these provides a grammar for things to show what they can do, to express their powers, to perform a prescribed motion.

III. PRINCIPLES OF COMPOSITION

Why refer to technical works and structures of things as grammars, why draw on this linguistic notion and suggest that we might end up talking of a language of mechanics, or a language of electrical engineering as a language for the things in which they express themselves?

The late 19th century mechanical engineer and engineering educator Franz Reuleaux (1876) leads the way. This, he would say, is what mechanical engineering is: to get a machine to perform a prescribed sequence of motions. When physicists study the laws of motion, Reuleaux argues, they find general principles by which they analyze the chaotic phenomena of motion as they occur, for example, when a feather falls from a tower. But when mechanical engineers build a machine, nothing is left to chance. They arrange mechanical elements in such a way that the force travels from one to another and performs a specific motion. In the machine, motion becomes domesticated or civilized, one state of the machine implies the next by a kind of logic. And the different machine elements are like a set of symbols where each has a specific meaning. They cannot be arranged at will but only in such a way that each element sustains and propagate the motion.

Three cogwheels, improperly arranged, can block each other and bring the machine to a grinding halt. But as the water pours into the waterwheel, the motion of the wheel can be translated into a motion by which a hammer ls lifted and drops on each of rotation. And this is what mechanical engineers learn: the grammar according to which wheels and gears, levers and clutches can properly translate rotary motion into linear or oscillating motion, by which heat can be translated into work, thermal into mechanical motion and *vice versa*. According to Reuleaux, therefore, machines are built from machine elements somewhat like sentences from words and somewhat like logical inferences from premises.

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There is a grammar, then, for mechanical engineers. It is a grammar of things and works in analogy to the grammar of words and sentences. It allows them to properly arrange elements such that they can form a meaningful whole. It also allows them to judge whether the resulting structure is well-formed. Once you know how to speak the language, the grammar fades into the background, it serves as an internalized standard of right and wrong. Those who know, can see or hear immediately what works and what doesn't. This is true also for electrical or software engineering, for architecture with its shape grammars and related concepts, but also for synthetic chemistry, pharmacy, and bioengineering.

These are grammars in the sense of providing principles of composition in spoken and written language, film-editing, mechanical and other forms of engineering, music. Music provides the most obvious example. There is counterpoint, romantic harmony, twelve-tone music – each with its own principles of composition that tell composers and listeners whether the tones are rightly arranged so as to carry the musical logic forward and so as to produce a desired effect. When we study our socio-technical world with its infrastructures, gadgets, and devices, we want to know how it is composed and how its principles of composition implicate us. This is how we study artworks, and this is how we understand our various languages in a multilingual world.

IV. THE MULTILINGUAL CONDITION

This is an invitation, finally, to look at „technology and language" not from the point of view of the philosophy of technology but from that of a complementary philosophy of multilingualism. When engineers are concerned to translate rotary into oscillatory motion, what kind of translation might we be talking about in our contemporary multilingual world?

In a world that divides between technology and language, the starting point was often enough a monolingual individual who goes on to acquire other natural languages, learning to say in a second, third, or fourth language what one knows to say in one's native tongue. Once we understand technology as language and language as technology, we can no longer take as our starting point the fiction of a literate monolingual individual. From the moment of birth we find ourselves in the midst of a cacophonous multilingual environment in which mothers and fathers, doctors, midwives, and nurses speak different languages, in which the bells and whistles of monitors, cell-phones, and alarms chime in, which is a highly codified built environment with signage everywhere (Aronin, 2018, Aronin and Singleton, 2013). In this world, we seek orientation not by acquiring this or that natural language but by seeking out the principles of composition that co-ordinate signs and actions. In many ways we are and remain illiterate in this world, and nevertheless learn how to negotiate, even to conquer it – in order to accomplish this, we mobilize many technologies and techniques.

For many years, philosophers and linguists have been debunking the notion of communication as an act of conveying representations from one mind to another. There has been an increasing awareness that communication has more to do with co-ordination,

with attunement to the principles of composition that inform a social order, a technical work, our symbolically and technologically constituted info-techno-sphere.

Alfred Nordmann

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Technology as a new Language of Communication between the Human Being and the World

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Abstract
This essay for the inaugural issue of *Technology and Language* is based on an analysis of the ‚epistemological turn' in modern cosmology and modern science, more generally. In view of another epistemological turn towards technology and a combinatorial approach to the creation of artefacts, the question regarding the languages of science and technology suggests itself. – When human beings relate to the world, they effectively address the world or talk to it, and the world talks back. This communication proceeds in different registers. It may have started in the idiom of myth. With the emergence of philosophy, a first language with a rational or methodical way of addressing the world came into being. Philosophy was superseded by the emergence of the language of science, and as of today, the language of technology comes into being and claims predominance.

Keywords: Human-world communication; Languages of philosophy, science, and technology

Аннотация
Данное эссе для первого выпуска журнала *"Технологии в инфосфере" ("Technology and Language")* основано на анализе "эпистемологического поворота" в современной космологии и современной науке в целом. В связи с очередным эпистемологическим поворотом в сторону технологии и комбинаторным подходом к созданию артефактов напрашивается вопрос о языках науки и техники. Будучи связаны с миром, люди обращаются к нему, говорят с ним, и мир дает им ответ. Эта коммуникация может быть выражена и записана по разному. Язык философии был первым языком рационально или методически обращающийся к миру. На его смену пришел язык науки, а затем конструирующий мир язык технологии, который сегодня становится доминирующим.

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Technology as a new Language of Communication between the Human Being and the World

INTRODUCTION

Throughout history, humans have demonstrated an amazing capacity for adaptation, this Darwinian criterion of evolution that complements natural selection. Quite conventionally, such forms of adaptation could be called "languages" in which the human spoke to the world, and with which the world spoke to the human. Their list is well known: myth, religion, philosophy, science.

If we take a look at the history of mankind retrospectively, we will see that, diachronically, the indicated languages of communication between the human and the world emerged in exactly the sequence of predominance from myth to science. It is also easy to see that any horizontal (synchronic) cross-section of human culture – mainly Mediterranean (European) culture – over the last 2-3 millennia reveals different combinations of the named languages and their share in the culture of a particular people. It is also easy to see that only "philosophy" and "science" are rationally expressed languages in this list. Let's briefly show this.

THE EMERGENCE OF THE LANGUAGE OF "PHILOSOPHY"

It is well known that the very term "philosophy" was introduced by Pythagoras. Literally, the word philosophy (ἡ φιλοσοφία) means "love for wisdom". But why did Pythagoras need this term, if there were people-sages (ὅι σοφοί) among his contemporaries and predecessors, who in his time personified knowledge (wisdom) about the world and man? We all remember their names: Thales of Miletus, Bias of Priene, Pittacus of Mytilene, Solon, Cleobulus, etc. Observing the world around them, they came to amazing generalizations and conclusions: "Time is the wisest of all things that are; for it brings everything to light" (Thales), "It is for wise men to foresee, before the difficult things come, so that they do not happen, it is for the brave to face them, should they happen" (Pittacus), "Choose the course which you adopt with deliberation; but when you have adopted it, then persevere in it with firmness" (Bias), etc. These conclusions were generalizations of everyday experience. Were they needed by the contemporaries of the sages? Certainly, they were, but experience is evolving and, consequently, with its change, generalized conclusions were forced to change. It was precisely this *instability of generalizations of ordinary* (basically *sensory*) experience that apparently did not suit Pythagoras. As a mathematician, he dealt with the nature of such objects as numbers, points, lines, planes, figures, etc., which do not directly depend on sensory experience. These objects are related to *intellectual experience*. But the demands of intellectual experience are of an entirely different nature. *Consistency* has always been and remains the main requirement justifying their feasibility. Their feasibility, in turn, required the observance of such requirements for the language as unambiguity, non-metaphoricity, non-emptiness of the designating term, etc. It is clear that the statement of Heraclitus that

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“one cannot enter the same river twice” looked rather like a metaphor in comparison to a rigorous proof of the Pythagorean theorem on the ratio of the sides of a triangle.

So, precisely in order to set himself (and his school) aside from the sages (ὅι σοφοί), Pythagoras introduces the term “philosophy”. He believed that one should distinguish *demonstrative* (justified, evidence-based) knowledge from *non-demonstrative* (not justified, not proven) knowledge.

That is why philosophy, in its original ancient Greek form, lays the foundation for all future European rationality. I agree that the term „rationality“ can be understood very broadly. However, in these pages I will use it in the meaning of “*reasonable* grounds, ways, methods and tools that a person uses in his relationship with the world (nature and society).”

Of course, the rationality that accompanied a person's daily life was extremely important, but it was, as they say, “ordinary rationality.” Its peculiarity lies in the fact that it never asks the question of “what is rationality in itself?”, or “what is the difference between rationality and irrationality?” Ordinary rationality is always "dissolved" in everyday life or, as they say today, is not perceived. It is quite another matter when there appear people asking these questions. They consider "rationality“ consciously. It is for this type of people that the "intellectual" accompaniment of any human activity becomes an independent subject of research. They consider intellectual activity (“rationality”) as a *method* by which humans relate to the world. We quite consciously compare this “method” with the “language” in which a person addresses the world, and in which the world responds. And it was this type of people who led humanity to the emergence of the first form of “science” or, if we use the Greek name – “Philosophy.”

The philosophy of ancient Greece for the first time gives the validity to knowledge with the help of “logical proof.” Philosophy should now not only generalize the facts of everyday experience, but *prove*, that is, *deduce strictly some true statements from initial true statements using the necessary nature of logical consequence*. It was a *qualitative leap* in the relationship of a person with the world, dramatically different from what “ordinary rationality” provided.

It was this necessity of the logical proof that Pythagoras insisted on, thereby showing that the statements of the Greek sages, although valuable to people, were nevertheless not strictly proven. Such a system of comprehending the world – understood as a new and singular language – became dominant for almost a whole millennium. On the basis of the philosophical tradition (essentially *analytical*) laid down by Pythagoras, a whole culture was formed, which is still alive today, but which, due to various circumstances, had to change, especially with the advent of biblical values in Europe.

After the end of Antiquity (5th century AD), it took approximately one millennium to establish the power of these values. By the 15-17th centuries, they were established in European countries almost everywhere.

However, the crisis of these values leads to an amazing result – the emergence of the *Renaissance of Antiquity*, and its “humanism” (15-16 centuries) is affirmed as its ideology. It should be admitted that this new “Antiquity” was no longer the same as the original one. Biblical values dramatically change its core, leaving the outer shell intact: *in the era of humanism, a symbiosis of Greek philosophical rationality and the biblical strategy of conquering nature is created.*

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THE EMERGENCE OF THE LANGUAGE OF "SCIENCE" (NEW EUROPEAN SCIENCE)

During the Middle Ages rational methods, and above all mathematics, were considered secondary, because their tools did not lead to the salvation of the soul. This situation changes dramatically in the era of humanism. Mathematics is recognized as the language of the "book of nature" (G. Galilei). What is the result? On the basis of this symbiosis, a new phenomenon is emerging – "new European science", which now takes on the mission to perform a no longer religious, but "secular eschatological project". *Science undertakes to accompany and implement historical progress, that is, it undertakes to make a person's life happy and prosperous*. It is easy to see this in the project of Rene Descartes, which he describes in his "Discourse on Method".

So, the main features of the transformation of the old rational language (philosophy) into a new one can be summarized as follows:

1) *Mathematics* (exact formal methods in general) *becomes the main language of the theoretical description of nature.*

2) *Experimentally obtained data on the essential properties of natural objects and processes become the empirical framework of science.*

3) *The main method (language) of new European science is the discovery of the forces and laws of nature and their further use for the benefit of the human.*

It was during this period (by the end of the 18th century) that science, having at its disposal the indicated tools, became the dominant form, and in fact, a new language of man's relationship to the world. This is evident not only in its outstanding achievements, but also in the ongoing process of its institutionalization.

We can safely say that the entire 19th century and the first half of the 20th century were a period of the unconditional triumph of science: the creation of the theory of electromagnetism gave humanity a new source of energy – electricity; creation of a relativistic theory and a theory of the structure of matter gave atomic energy. This list of scientific achievements can be continued further. Science, which undertook to implement a progressive project – "finding an earthly paradise" – produced colossal results, but it did not succeed in making a person completely happy. Indeed, along with the benefits of civilization, science has brought with it a great many of its evils.

However, the belief in the unconditional triumph of modern European science as an institution, and scientific new European rationality as its basis, was undermined by the questions: "What is the nature of objects of science (for example, mathematical)?"; "What is the nature of the laws discovered by science (for example, physical)?"; "Is scientific knowledge itself justified or are all its provisions of the convention that we accept on a contractual basis?" The list of these questions can be continued further.

The inadequacy and unsatisfactory nature of such a justification, which began to reveal itself approximately from the end of the 19th century and especially at the beginning of the 20th, laid the foundations for the process that would later be called the "crisis of scientific rationality". It can easily be seen in the titles of the works that reflect this process: "The Crisis of European Sciences and Transcendental Phenomenology" (Husserl, 1936/2012); "Farewell to reason" (Feyerabend, 1987), etc.

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However, if we look closely at this crisis of scientific rationality, we will be forced to admit that it is much more complex than just a "crisis of foundations". In order to present this complexity more vividly, let us reproduce once again one of the essential characteristics of science, its main method:

"*... the discovery of the forces and laws of nature, and their further use for the benefit of the human ...*"

After all, it was precisely the leadership of science in using this *method* (in fact, the *dominant language of communication between the human and the world*), in comparison with other languages (forms of knowledge), that ensured its dominance over these forms!

Now let's ask an unexpected question: what is starting to happen with the method of science in the second half of the 20th century and the first decades of the 21st? The answer is obvious: *modern science discovers less and constructs more*. All this allows us to say that in the modern world, "science", understood as the language of communication between man and the world, is gradually losing its dominance.

THE EMERGENCE OF THE LANGUAGE OF "TECHNOLOGY"

The dominant language in the relationship between man and reality is being replaced by a new form – technology! Whether science wants it or not, like the other forms (philosophy, religion, myth) it is forced to adapt to the new leader – to ensure the feasibility of its main method. And in fact, if a matured humankind that grew up on the discoveries of science, does not yet have enough of those laws and sources of energy which were provided by science, then it is simply forced, for its own preservation, to create and design new ones. The main result of the changes that have occurred is that:

1) *Technology is gradually becoming the dominant form of human relations to the world, or, in the terms of this essay, a new language for human relations to the world.*

2) The main method of technical relations is the construction of a new nature, or simply redesigning of nature, and its further use for the benefit of humanity.

From this, naturally, it follows that rational human languages such as "philosophy" and "science" acquire (or will acquire in the near future) a subordinate position in relation to the language of "technology": *they will all be called upon to serve technology as the dominant mode of the human relationship with the world*.

The most intriguing question in the current situation is, from my point of view, the question of whether "technology" is the *last* language of human communication with the world? "The last" in the sense that humans, with the advent of the unrivaled dominance of technology, may themselves cease to be *natural beings* in the sense in which Aristotle (trans. 1991) spoke about in Physics, B 1.

I dare hope that the upcoming events will not leave this question unanswered...

Andrey Pavlenko

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Good Engineering Design – Design Evolution by Languages

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Abstract
This essay for the inaugural issue of *Technology and Language* shows that the mastery of multiple languages is the enabler for good engineering design. Engineers express ideas and for that they need expressive design languages. If a language is a structured system of symbols serving communication, the languages of engineering include German, English, and Russian, mathematical and programming languages, technical drawing and formal modelling, with abstract design elements constituting a further, engineering-specific language. The semantics and thus the basic elements of these languages constitute the design space, whereas the syntax constrains the expressivity of the language and structures the design space.

Keywords: Design; Languages of engineering; Good engineering; Communication

Аннотация
Данное эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* показывает, что владение множеством языков необходимо для хорошего инженерного проектирования. Инженеры выражают идеи, и для этого им нужны выразительные языки. Если язык представляет собой структурированную систему символов, служащую для коммуникации, то языки инженера включают немецкий, английский и русский языки, математические языки и языки программирования, плюс специфический для инженерной мысли язык, состоящий из технического чертежа, формального моделирования, с абстрактными элементами дизайна. Семантика и, следовательно, основные элементы этих языков составляют пространство дизайна, тогда как синтаксис ограничивает выразительность языка и структурирует пространство дизайна.

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THE ENGINEERING DESIGN PROCESS

The passion of Gaston Lagaffe, the main character of the comic strip drawn by Franquin, is driven by the desire to make his life easier through machines he invents, builds, and operates himself (Bonfillon, 2017, fig. 1). As that, Gaston is a caricature of the intuitive, creative, ingenious engineer. He is curious, open to the design space in front of him. He is courageous and playful like a child – yet not "spoiled" by education: Gaston apparently does not need any language as enabler of good engineering design.

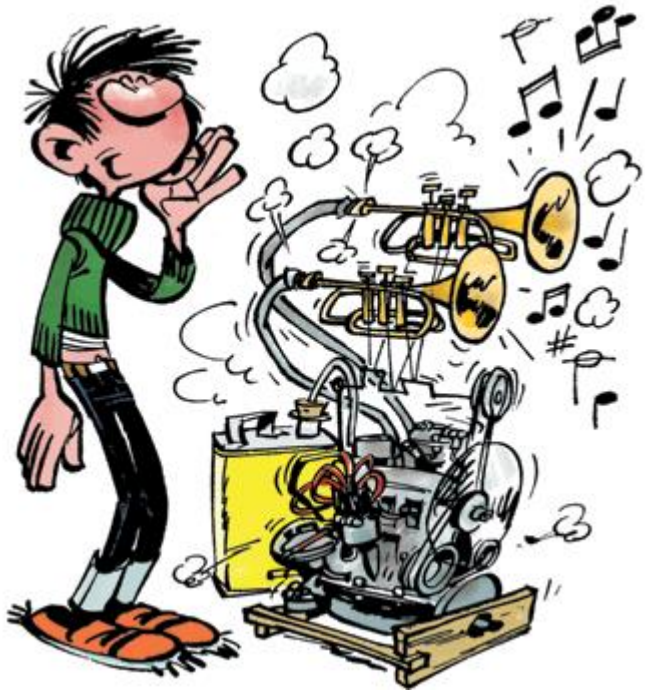

Figure 1. Gaston: le livre des inventions © EDITIONS PRISMA 2017, after Franquin © DUPUIS 2020 www.dupuis.com – All rights reserved

The German word "*Ingenieur*" fits Gaston perfectly. It derives from the Latin word *ingenium*, which means ingenuity. This word stands for the invention process itself. In contrast, the English translation engineer focuses on the result of the innovation process, the engine or more generally the cyber-physical machine.

In fact, the caricature represented in Gaston has its exemplars in today's society. Two examples to illustrate this: The one is the inventive spirit of the ISS astronauts recently praised by the media. They located a leak in the International Space Station by analysing the trajectory of a tea bag. The tea bag and the extrapolation of the trajectory formed the measuring system. Once located, armoured adhesive tape was used to seal the leak. The other example is Artur Fischer who filed his famous dowel invention with the

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German Patent Office in 1958. Up to today Fischer filed more than 1000 patents and created the *fischertechnik* construction sets,

Gaston and his fellow ingenious people teach us that the design process consists of four major steps: (i) the formulation of desired function and quality, (ii) defining the design space, (iii) deriving the composition, and (iv) the evaluation of realised function, quality, and most important acceptance. In the first phase (i) the needs result in the specified function, the expected quality dimensions regarding effort, availability, and acceptability are determined. In the subsequent second phase (ii) the design space is formed out of the available resources, i.e., materials, components, technologies. In the third phase (iii) the overall function is divided into sub-functions forming a function structure. Each sub-function or a group of sub-functions is assigned to one cyber-physical component fulfilling this sub-function. By this assignment process a cyber-physical system is composed. In the fourth and final phase (iv) the system's function, quality and acceptance is verified and validated by means of evaluation metrics and methods.

This final step of verification and validation is where Gaston's inventions go awry in the comic strip, earning him his last name Lagaffe. To master the whole design process and to enable good engineering design, the mastery of languages is essential. To verify this, we have to shed some light on engineering languages first.

TRANSLATING FROM ONE DESIGN LANGUAGE TO ANOTHER

What are the languages an engineer should master to achieve functionality and quality? To answer this question, we start with a statement formulated in the year 1896 by the Chicago architect Louis Sullivan in the English language:

"form [...] follows function"

It is a short and elegant design maxim (Sullivan, 1896). But in times of limited resources on the one side and critical environmental impact of technical systems on the other side, there is a demand for economic and ecological quality of systems:

"less but better"

is the quality objective formulated by the influential designer Dieter Rams (1995). This is nothing but Occam's razor, which often is the basis for a perceived beauty of technical systems. In fact, the author is convinced that humans have an intrinsic desire to reduce complexity and achieve beauty. The instruction for good design combines both statements into:

Maximise quality subject to functionality!

This instruction for action is without loss of information translated from the English language to the language of mathematics

$$\max_x f(x) \;\; s.t. \;\; g(x) \leq 0.$$

The instruction for action in the background of sustainable systems design is a constraint optimisation problem. Here, $f(x)$ is the multi-criterial quality or objective function, $g(x)$ stands for both functional constraints and constraints given by the techno-

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economic reality. Hence, good design results from proper selection of the design and operation variants x according to this instruction.

The third language is a programming language to communicate with a computer capable of solving the constraint optimisation problem. For this a language such as Python (2020) is used to define the objective function and the constraints in a manner a computer can understand:

```
def multi_f(x):
        sum_ = pow((pow(x[0],2) + x[1] - 11),2) + pow((pow(x[1],2) + x[0] - 7),2)
        g[0] = -26.0 + pow((x[0]-5.0), 2) + pow(x[1],2);#constraints.
```

The design space is limited firstly by the techno-economic reality and secondly by the restrictions given by society in form of directives, such as the eco-design directive of the European Union. It may be extended by innovations and new sourcing possibilities. As a result, the design space is given by the available materials, components, and technologies.

SEMIOTIC AND SYNTAX IN ENGINEERING LANGUAGES

In the design process, not the physical items fill the design space but their representation as symbols as sketched in Figure 2 each symbol evokes an intended object, process or model.

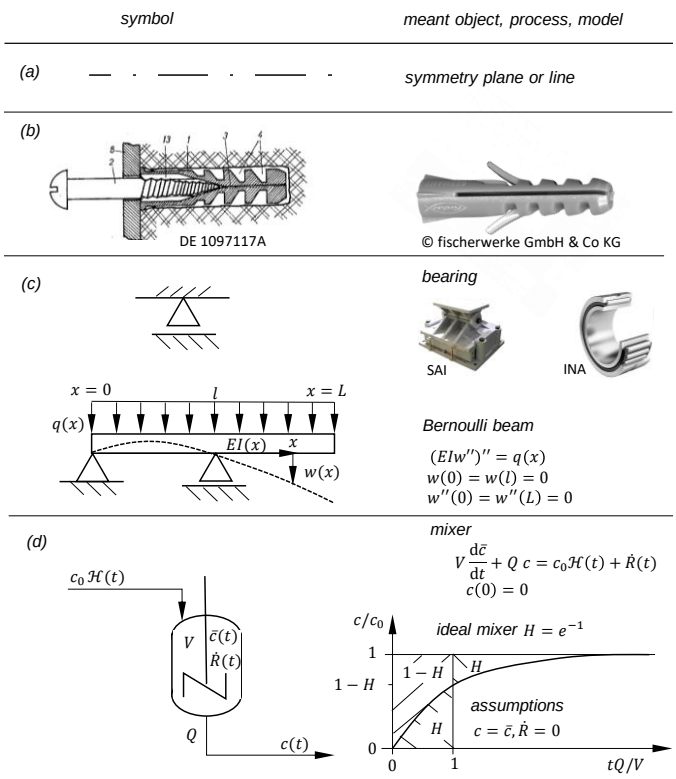

Figure 2. Symbols evoke intended objects, processes or other models such as mathematical physical models; (a) representation of a symmetry line or plane; (b) technical drawing taking from Artur Fischer's dowel patent 1958, (c) symbol of a loose bearing in technical mechanics representing a bridge support or a needle bearing of a rotating shaft; the schematic sketch represents a mathematical boundary value problem for the beam deflection; (d) the symbol for a mixing vessel is standardised by DIN EN ISO 10628. This symbol points to a physical object and/or to an initial value problem for the evolution of the outlet concentration.

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The line (a) symbolises a symmetry plane or a symmetry line for an axisymmetric design. The cross section of the dowel (b) symbolises the dowel. The rules in technical drawing are such that the screws are not catted. In fact, Fischer knew this convention typical for a language serving communication. He only missed the symmetry line in his sketch used in his patent.

The technical drawing is an assembly of symbols suggesting the physical dowel and the mounting process. Like symbols in the Chinese written language are often abstracted physical items, the symbol of a bearing is derived from the appearance of a bearing used to support bridges. It indicates such bearings used in civil engineering as well as the bearings used to support a rotating shaft but allowing axial movement as the sketched needle bearing. Engineers are educated to have similar abstract representations of beams, bars, ropes, membranes, plates and so on. Each of these abstract pictures is connected to physical-mathematical models with a convention of idealisation. Thus, the assembled signs in (c) point to the concept of a Bernoulli beam and this concept in turn points to a mathematical model representation in form of a boundary value problem. In process engineering (d) the symbols are standardised in normative texts such as ISO norms. This standardisation of the symbols fosters communication since different engineers do have the same association. Thus the symbol means a mixer. The engineer trained in process engineering further has the model of an ideal mixer in mind. Analog to the Bernoulli beam, the ideal mixer implies some assumptions resulting in knowledge about the residence time distribution.

What was said so far fits to the characteristics of languages. To recapture, a language is a structured system of symbols serving communication. This may be the communication between a person and a second person, furthermore, it may be the communication between a person and a machine, or it may even serve thinking, i.e., self-communication. The syntax gives the way in which symbols are allowed to be structured or represented. The semantic, i.e. the collection of symbols, gives the design space.

ENGINEERS NEED TO EXPRESS THEMSELVES IN DESIGN LANGUAGES

The design process as any intellectual process is strongly influenced as well as supported and indeed limited by the language itself.

"The boundary of my language represents the boundary of my world"

is a well-known statement by the trained engineer and philosopher Ludwig Wittgenstein (1922). This is also true for engineering design. In every language there are different levels of mastering the language. The better a person masters a language using the full set of syntax and semantics, the more expressive the person can be. This is true for all languages an engineer has to speak.

So far the languages for engineering are spoken and written languages such as German or English, the language of mathematics, programming languages and technical drawing. But also abstract design elements such as bearing, beam, mixer are elements of a further engineering language. Those abstract design elements, the components, point to

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mathematical models or constraints and are understandable for engineers provided he or she masters this language.

The advantage of this abstraction is that the engineer (or the machine) can be focused and can handle complexity.

For good engineering design, the mastery of languages and being able to express oneself in these languages is crucial. Engineering education is all about learning engineering languages. Hence, also Gaston Lagaffe should start studying to express his creativity in a targeted manner to succeed with his inventions.

Peter F. Pelz

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The Techniques of the Arts

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Abstract
This essay for the inaugural issue of *Technology and Language* explores the languages of the theatre which define and constrain its mode of production. The very inability of the theatre to establish, even as an illusion, a non-theatrical reality, turns out to be its major asset and strength. Especially in regard to Bertolt Brecht and Walter Benjamin's reflections on history, technology, and Brecht's epic theatre, the peculiar grammar of gestural reading and writing becomes apparent. A quotable gesture is not tied to a particular subject but stands, frozen in time, as an element of action. It exposes the unfulfilled promise of a historical moment, allowing theatrical techniques to uncover the message of redemption in the cultural material of a tragic past. Accordingly, the many intersecting, non-instrumental technologies of theatrical production give us a language for reading history and deciphering here and there an index of a better future that was buried in the past.

Keywords: Art; Techniques of the theatre; Walter Benjamin; Bertolt Brecht

Аннотация
В этом эссе для первого выпуска журнала *"Технологии в инфосфере" ("Technology and Language")* исследуются языки театра, которые определяют способ постановки. Сама неспособность театра создать, даже как иллюзию, нетеатральную реальность, оказывается его главным достоинством и преимуществом. Это, в частности, касается размышлений Бертольда Брехта и Вальтера Беньямина об истории, технологиях и эпического театра Брехта, где становится очевидной своеобразная грамматика жестового чтения и письма. Изображаемый жест не привязан к конкретному предмету, он застывает во времени, как элемент действия. Он отражает невыполненное обещание исторического момента, позволяя театральным техникам раскрыть послание искупления в культурном материале трагического прошлого. Соответственно, множество пересекающихся, не-инструментальных техник театральных постановок предоставляют нам язык для чтения истории и расшифровки индекса лучшего будущего, которое похоронено в прошлом.

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The Techniques of the Arts

The arts have command of their specific technical means of production. These technical means vary according to the artistic discipline that makes use of them to render its products. The works or products of the arts are as diverse as the arts themselves. Roughly speaking, the arts are divided into the performative (performing) and visual arts. The performative (performing) arts essentially produce ephemeral products, the visual arts material artefacts. The production of these products requires techniques which in the performative (performing) arts engage the use of bodily powers, and in the visual arts recruit and organize materials, instruments, tools and entire production facilities. These techniques are tied to the special abilities of the artists, who have skills in dealing with the powers and forces, tools and forms of production. Furthermore, there is an ongoing discussion about the fact that the use and application of the techniques of the arts is nothing without creativity, inventiveness, and imagination. Without these, it is said that the techniques of the arts are not sufficient to produce art.

The question of the nature or essence of art is not what concerns me here. Nevertheless, the question of what art is, what distinguishes it from the artistry of artisans, and what renders its products unique will have to be asked again and again – even more so when the focus is on techniques and the technical side of art. The fine arts, video, theatre, and dance programs at academies and schools of higher education always ask this question, at least implicitly, even if they try to avoid it. They probably try to avoid this question because it touches on the sensitive question whether the arts are as teachable as are the crafts.

PERFORMING AND VISUAL ARTS

The question regarding the technology and the techniques which afford the physical manifestations of the arts, sounds banal, the answers aren`t. The question concerns the differentiation of the various materials and its significance for the products of the various arts. The distinction between the performing and visual arts, for instance, rests on the differentiation of the materials of their art. The core material of the performing arts is the human body and its actions, which shape the artwork – in contrast to painting, for example, where the instruments are also implemented and guided by physical action, but where this action does not normally appear directly in or with the artwork.

Just as the arts have techniques and procedures that are diverse, multifaceted, and discipline-specific, the arts have languages. The visual arts speak a language that is bound to images and forms, the performing arts speak the languages of physical expression. In the so-called theatre of the spoken word, the arts also speak the language of language (in opera this is singing, in drama it is monologue and dialogue).

Drama uses the languages of the human body. As such it is closest to our social reality. This reality is a language-bound reality, some say it is a linguistic reality.

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THE DRAMATIC THEATRE AND ITS METHODS

Dramatic theatre mediates between reality and form with its practices and procedures. Perhaps the most interesting among the arts, it practices in an artistically designed environment by way of a fusion of techniques of the body, of speech, of the social. Performances create and use a complex, structurally and systematically executed production process, which turns a given text or material for speech into a complex social experiment. This experiment is, among other things, repeatable and sets in motion repeatable communication processes as the same production is performed again and again. In contrast, the process that produces the experiment seeks novelty, surprise, and uniqueness.

Despite all attempts to mechanize and formalize it, dramatic theatre revolves around the human figure in a created space. (This is the resistance of the theatre against the modern forms of representation and narration such as film or television).

The process of making a few pages of written words (drama) become reality is a mixture of social creativity, structural adherence to certain procedures, ingenuity, and the deployment of instrumental and physical forces. Before each production there is nothing but the intention to "read" and transform a text through the production process of the theatre. This is the basis and the raw material from which the reality of the scene is created. The routines and techniques of the theatre enable it to produce unique performances. They also enable the theatre to constantly recreate itself. The recreation of the theatre is a learning process induced by the use of its production practices – stable environments, technical frameworks related to the human body at their center – and its actors.

Mediating between reality and form, a fusion of physical, elocutionary and social techniques, organized around the human body, an intentional reading of drama and recreation of itself, these then are the texts of the dramatic theatre.

THE TEXTS OF THE THEATRE

The storehouse of dramatic texts represents "*Urtexte*" (source texts) or traces that lead into the routines and production practices of the theatre and engender various new unpredictable forms of text. All text forms that the theatre creates are designed to communicate. As such they reach beyond the exhibited performance which is a finalized test of how the social experiment of staging the text worked out, inviting the audience, in turn, to read the production process. So, the staged performance is only another text of the theatre, by no means its product.

The texts of the theatre are the technical prerequisites on which the work of the theatre is based – the plays (the writings of the theatre), the buildings, sites and areas (the places of the theatre), rehearsals, construction forms, performances, reviews, public communication (the routines of the theatre), actors, directors, stage and costume designers, builders and stage hands, stage managers (the actors or agents of the theatre).

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But the texts of the theatre are also the cultural and socio-political attributions that situate the theatre in society. In this context, the theatre has experienced a wide variety of definitions which, roughly speaking include

- the ritual or cult of coping with the powerlessness of humans in the face of the violence and power of the gods or nature,
- the psychological process of confronting the inner nature of people
- the moral improvement of people and the communicative form of social self-affirmation and education.

These functions (or texts) each have their own internal structures and work simultaneously for – and with – each other. Together they form the grand narrative of theatre as the play of society with itself. At the same time, theatre is a game with the question of redemption and overcoming the tragic state of the world. The theatre develops its texts to offer humanity a kind of everlasting hope. The theatre helps to make the unimaginable imaginable.

SELF-REFLEXIVITY

The various texts of the theatre address its own practices of production. Like all art, theatre thus has, and needs to have, a tragic capacity for self-reflexivity. And especially the theatre needs to have this. In its narratives the theatre always tells its own story. With its most desperate attempts at depicting real events as closely as possible, the theatre does not succeed in placing the performers in non-theatrical reality. (And if it does, then only as a deception, which proves the imprisonment of the medium within its own boundaries. Heiner Goebbels demonstrated that ingeniously in his work "*Eraritjaritjaka*").

So, since theatre is unable to escape outside of itself, much effort is put into creating the impression that the performance on stage is taking place for the first and only time. The techniques used to make the routines of repetition invisible arise from a bet on the paradox of the theatre: on the one hand, the trace of the literary precept is followed – this is the promise the theatre makes to the spectators – but on the other hand, this trace must be embedded within the logic of a specific version – "handwriting" or "interpretation" – in order to claim validity.

The theatre always remains in its textual domain. It cannot be brought into congruence with the realities that it tries to depict, reconstruct, deconstruct or illuminate. Theatre remains play and is condemned to remain play. But that is in turn its exceptional achievement and its potential.

THE TECHNIQUES OF THEATRE

Since the 1920s, Walter Benjamin has attempted to think of technology in non-technological (non-instrumental) terms. Technology then serves not to rule over nature but to shape the relationship between humans and nature. For Benjamin, technology as a medium between human and nature has the potential to function as a universal language, i.e. a language used by both sides. If technology is the medium in which humans and

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nature meet, then there are several ways to orchestrate this encounter. "Good" (non-instrumental) technology creates a space in which the relationship between humans and nature can be shaped freely and playfully. Art has its place in this space of non-purposeful interaction. Art opens a space to try, test and practice the relationship between humans and nature, to discover the unplanned, to experience surprises, to situate amazement as the opposite side of knowledge and recognition. All this can serve to interrupt the catastrophic course of history, to overcome relationships of oppression, domination and violence. Here the idea of redemption, which Benjamin pursues throughout his entire work, plays a decisive role. In the course of history humankind has distanced itself from the state of redemption and thus from the perfect realization of the promise of happiness that it carries within it ("the hapless angel"). Since history seems to accelerate this distance, the task of humanity is at all times to interrupt this movement: if the past carries within it a "secret index" by which it refers to redemption[1], then this index must be deciphered by the present. How can this deciphering happen? The promise of the past is hidden in the cultural assets that have been left to the present. Among other things, these are the conversations and disputes, the hope and despair that dramatic literature offers us. The role of the theatre is to make these voices from the past audible, to hear and understand the messages that former human generations left us and to integrate them into our present life. The techniques of the theatre serve the remembering and re-presenting of these voices and the playful handling of their meaning. What is the playful approach of the theatre to its material? Benjamin projects his idea of the redeeming power of the theatre on Bertolt Brecht's experiments. In Brecht's epic theatre, Benjamin discovers the "dramatic laboratory" in which the theatre recovers its age-old opportunity, namely the "exposure of the present" (Benjamin, 2011b, p. 693). In the epic theatre, Benjamin finds a counterpart to his philosophy of history which is strictly oriented towards questioning the concept of progress and exposes the interruption, the standstill as an opportunity to reorient the catastrophic course of history. The epic theatre practices this stopping of the action, the interruption of progress. This ties in with an Aristotelian concept of action and thus sets itself up against a bourgeois subject-centered understanding of theatre. Aristotle had already emphasized action, and not the person, as the central element of the theatre[2], prescribing variations to the action in the Brechtian sense in order to be and to remain exciting – providing unexpected turns.[3]

The epic theatre is based on interruptions in the progress of the action. These interruptions of the plot generate gestures, for Brecht the essential element for producing knowledge and pleasure. "Making gestures quotable is the actor's most important achievement; he must be able to block his gestures like a typesetter blocks words" (Benjamin, 2011b, p. 536). With the gesture the actors surrender themselves to the event,

[1] The past has a certain index by which it is referred to salvation (Benjamin, 2011a, p. 693).
[2] "For Tragedy is an imitation, not of men, but of an action and of life" (Aristotle, ca 350 B.C.E/1902).
[3] "Tragedy is an imitation not only of a complete action, but of events inspiring fear or pity. Such an effect is best produced when the events come on us by surprise; and the effect is heightened when, at the same time, they follow as cause and effect" (Aristotle, ca 350 B.C.E/1902).

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which cannot be traced back to any particular subject. They become the objects of their gestures. The epic theatre makes these gestures quotable, repeatable and exhibitable. Since they mean nothing other than social agreements, routines, and behavioral patterns tied to them, they can be exhibited, quoted, and varied in the dramatic laboratory. This is probably the “age-old opportunity of exposing the present” that Benjamin speaks of. It allows "present existence to splash out of the riverbed of time" such that it will "dazzlingly stand in emptiness for a moment." This is the moment that Benjamin calls remembrance (“*Eingedenken*”) in another place: the course of time comes to a halt, allowing those present to recognize and marvel at the fragments of the past, moments that are not yet completed.

Benjamin’s interest in theatre is giving it a role that meets the "messianic mission" of the present: making the past readable with its unfulfilled claims. Art, and especially the theatre, playfully, experimentally, and constructively test the use of the techniques for making history and the world readable.

Thus the theatre becomes the language and the tool for finding and realize happiness, reading and exhibiting what is inscribed as an unredeemed promise in the handed-down material. The languages and techniques of the theatre would thus be understood as the non-instrumental medium in which humankind practically and constructively puts to test the idea of universal happiness.

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Quantum Hermeneutics and Its Essential Questions

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Abstract
This essay for the inaugural issue of *Technology and Language* presents a research program for Quantum Hermeneutics which serves as a theory for the epistemology, methodology and ontology of quantum texts and their understanding. As opposed to the texts of classical science and in this regard more like the texts of the humanities, quantum texts require interpretation. But as opposed to the humanities, quantum text concerns trans-empirical experience of a trans-empirical world – the quantum text is written as scientific technology prompts quantum objects to reveal themselves as a readable text that requires interpretation.

Keywords: Hermeneutics; Quantum mechanics; Quantum technology; Quantum text; Trans-empiricality

Аннотация
Данное эссе для первого выпуска журнала *“Технологии в инфосфере” (“Technology and Language”)* представляет исследовательскую программу по квантовой герменевтике, которая служит теорией эпистемологии, методологии и онтологии квантовых текстов и их понимания. В отличие от текстов классической науки и в этом отношении сходно с текстам гуманитарных наук, квантовые тексты требуют интерпретации. Но в отличие от гуманитарных наук, квантовый текст касается трансэмпирического опыта трансэмпирического мира – квантовый текст написан, поскольку научная технология побуждает квантовые объекты проявлять себя как читаемый текст, требующий интерпретации.

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Quantum Hermeneutics and Its Essential Questions

Contemporary quantum science and technology, represented by the theory of quantum gravity (including superstring theory, loop quantum gravity, etc.), contemporary quantum technology (including quantum information theory) and so on, has given rise to the second quantum revolution (Georgescu, 2014). However, how to understand contemporary quantum science and technology is still debated. It is imperative to understand and interpret contemporary quantum science and technology, hence, a quantum hermeneutics must be established. Quantum hermeneutics has become an academic concern, and the National Social Science Fund of China has set up the VIP project "Contemporary Quantum Hermeneutics Studies."

Hermeneutics has developed through classical hermeneutics, universal hermeneutics, Dasein hermeneutics and then into contemporary hermeneutics. But contemporary hermeneutics still cannot interpret the quantum world, contemporary quantum theory and contemporary quantum technology. For this reason, hermeneutics itself needs to be creatively developed into quantum hermeneutics. Scientific hermeneutics as proposed by Husserl, Heidegger, etc., and the hermeneutics of quantum mechanics by Patrick Heelan (1995) and others can be considered early forms of quantum hermeneutics. Quantum hermeneutics is the study of the ontology, epistemology and methodology of quantum text and the understanding of it.

ESSENTIAL MEANING OF "TRANS-EMPIRICAL"

The quantum world is different from the classic world; the theory that describes the former is different from that for the latter. I have been recommending the concept "trans-empirical" to characterize the universality of quantum theory, and to explore issues regarding the interpretation of quantum theory. "Trans-empirical" is not the same as Kant's transcendental and transcendent. Kant's transcendental (*transzendental*) refers to what is prior to experience (*a priori*) and makes experience possible; if the concept is beyond experience, he uses the word "*transzendent*." The essential meaning of "trans-empirical" is that it is beyond experience, that it is not detached from experience and that it can also make experience possible (Wu, 2019). The concept "trans-empirical" includes partial meanings of *transzendental* but also remains connected to experience, i.e. it captures the relationship between quantum theory (especially superstring theory and quantum field theory) and experience. "Trans-empirical" can qualify reality and method as well, leading to "trans-empirical reality" and "trans-empirical method," respectively. Thus, the fundamental meanings of "trans-empirical" include the following:

(1) It goes beyond old experience and forms new experience.

(2) Theory *guides* experience. It is generally believed that experience is theory-laden, while in contemporary quantum theory a theoretical guidance exists at first, but then new experience will be formed.

(3) It is not detached from experience, but also makes experience possible. Superstring theory goes beyond the experience of classical physics and that of quantum mechanics, pointing to possible new experience.

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QUANTUM TEXT AND ITS CHARACTERISTICS

Hermeneutics is the theory of understanding of texts and technology of understanding. Related research of quantum theory will produce quantum texts, and the hermeneutics for exploring quantum texts will form quantum hermeneutics. Quantum hermeneutics is the theory of the epistemology, methodology and ontology of quantum texts and the comprehension of them.

I propose that quantum text should be narrowly defined, only the texts of quantum theory and quantum experience should be regarded. The quantum world and the world of quantum technology are two different worlds. The advantage of that division is that it relates to the original state of things. The text of quantum theory is the knowledge system of quantum theory, consisting of quantum concepts, quantum laws, quantum theorems, etc. The text of quantum experience and technology is a description of the observation and measurement experience of quantum phenomena and processes.

Quantum text is written not only in the classical form but it also uses mathematical language that reflects properties of quantum theory. Its sense and reference reveal the quantum world intrinsically. The quantum world is one of the original sources of quantum text. Quantum technology is the product of the interaction between quantum world and quantum text. The meaning of quantum text is divided into a fundamental sense, reference meaning and contextual meaning (Wu & Ye, 2018). Quantum text has the following characteristics:

(1) Uncertainty. The uncertainty of the quantum world is rooted in Heisenberg‘s Uncertainty Relation. Although there are corresponding mathematical equations to describe the world of superstring theory, the quantum text of superstring has the character of uncertainty due to the lack of direct empirical evidence.

(2) Certainty. The mathematical expression of Heisenberg‘s Uncertainty Relation is determinate. The wave functionψcompletely describes the state of the quantum system and it is determined by the Schrödinger wave equation. The wave equation is determined and the revolution of the wave functionψin the sense of the quantum world is causal and deterministic. The new Heisenberg Uncertainty Relation shows that the physical quantity which could not be determined simultaneously before can now be determined simultaneously under the influence of quantum information technology such as quantum entanglement (Berta et al., 2010).The uncertainty of quantum world is relative, not absolute (Wu, 2016).

(3) Autonomy. The autonomy of quantum text reflects the independence of the meaning of quantum text: The meaning of a quantum text exists independently, does not depend on its author, nor on those who want to understand it.

(4) Objectivity. Knowledge of the quantum world is objective independent of human consciousness. It is a description of different perspectives on the quantum world. The whole constitutes a complete quantum world. The objectivity of quantum text is rooted in the objective quantum world.

(5) Trans-empiricality. Quantum text describes a trans-empirical quantum world. Quantum theory is trans-empirical, therefore, the quantum texts must have the character of trans-empiricality. Classical scientific texts do not have that character; some texts in the humanities do.

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CHARACTERISTICS OF QUANTUM INTERPRETATION

Different from the interpretations of classical science and from humanities texts, quantum interpretation exhibit the following aspects:

(1) Quantum interpretation provides a unification of certainty and uncertainty. The interpretation of classical science is not important, but when it comes to quantum mechanics, the interpretation is a must. The reason is that quantum has the character of potentiality and trans-empiricality, furthermore, there should be a formal system of quantum theory (including the antecedent conceptual system). However, it is impossible to make scientific explanations and predictions of the quantum world merely with a formal system. Three factors – observer, probability, and wave function – are also important reasons why the theory needs to be interpreted.

The interpretation of quantum mechanics is aimed at an authentic description of the world of quantum mechanics. It is a description of one aspect of the quantum world. The quantum phenomena that are easy to deal with in one version of quantum mechanics are hard to deal with in another. Each interpretation of quantum mechanics requires different concepts, theoretical presuppositions and formal systems, that bring the creativity of scientists (authors) into the theory of quantum mechanics.

(2) Understanding loops. The comprehension of quantum text unfolds in a hermeneutic cycle. In understanding a quantum text, there exists an internal loop of quantum text firstly, that is, the loop between the quantum theoretical text and the quantum empirical text. And secondly, there exist external cycles of quantum text, the first of that is the loop between quantum world and quantum text and the second is the loop between quantum text and quantum technology. The loop between quantum world, quantum text, and quantum technology actually means that the test of quantum theory requires both scientific prediction of quantum theory and the forecast of technological products, which reflects the unification of understanding, interpretation and application of hermeneutics.

(3) Truth in quantum interpretation. Under the conditions of different quantum texts (concepts, theories, etc.) and quantum technologies, certain properties of quantum systems show themselves. We cannot infer the properties of the quantum system before a measurement from the properties after the measurement. Microscopic particles are not "pre-set" into a certain, unchanging pattern (Wu, 2011).They do not have a fixed existence. The cognition on the ontological state of microscopic particles can be revealed only with the help of quantum technology, and only some truths about microscopic particles can be revealed.

Let's look at a quantum proposition: “atoms were rearranged to spell the letters IBM.” In 1990, IBM scientists used quantum technology – the scanning tunneling microscope (STM) – to move with its tip xenon atoms on the surface of nickel, and after a long period of operation, 35 xenon atoms spelled IBM. Obviously, the proposition is true – to display atoms with quantum technology, and then to manipulate atoms to rearrange them into an IBM shape. Here, the displaying or revealing by quantum technology is to bring out the atoms, that is the truth of practical ontology, i.e., the subject’s cognition of the arrangement shape is consistent with the actual shape of the atoms.

Revealing the truth of the quantum text "atoms were rearranged to spell the letters IBM" belongs to the hermeneutical truth of quantum text. It is the combination of the

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truth of practical ontology and the truth of practical epistemology. Through practice, the objective reality of the quantum world is revealed; through epistemological comparison, the subject's cognition is compared with objective reality. Therefore, hermeneutical truth = truth of practical ontology + truth of practical epistemology = practical truth (Wu, 2019).

Practice of quantum technology enables the existence of microscopic things to be presented, but different quantum concept systems will have different interpretations of quantum mechanics. That is:

Truth of practical ontology + different description systems of quantum mechanics (truths of different practical epistemologies) → different interpretations of quantum mechanics.

RESEARCH PLANS IN THE FUTURE

The meanings of the study of quantum hermeneutics include: (1) To construct a new contemporary quantum hermeneutics research program from the perspective of the interaction between scientific and technological hermeneutics (including hermeneutics) and contemporary quantum science and technology, to break through the original research paradigm of hermeneutics, and to expand hermeneutics from text to micro (quantum) domains. Some new hermeneutic concepts will be put forward, such as quantum text, quantum distance, quantum horizon, quantum understanding, quantum effect history, etc.

(2) The original research objects of hermeneutics are macroscopic or classical objects. Quantum hermeneutics will form new concepts, new categories and new philosophical systems of scientific and technological hermeneutics (including hermeneutics), that will give rise to a quantum turn of hermeneutics.

The main problems to be solved by quantum hermeneutics are (1) Hermeneutical analysis of quantum text. The relationship between quantum text, quantum world and quantum technology. Can hermeneutical analysis be brought to quantum objects?

(2) Reality of contemporary quantum hermeneutics. Is this reality objective or constructed? What is the difference between a hermeneutical realism analysis of quantum objects and the general scientific realism?

(3) What is the understanding structure – of laypeople or of experts – of quantum text? What is the understanding standard of quantum text? How are quantum understanding, interpretation and application related? Horizon fusion of quantum text: Can quantum and classical visions be integrated?

(4) Post-truth in quantum hermeneutics – what is the relationship between post-truth and practical truth?

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A(l)gora: The Mindscape

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Abstract
This essay for the inaugural issue of *Technology and Language* articulates how we inhabit public space in the critical tradition of the Enlightenment and in the condition of contemporary cyber-technologies. The fabled *agora* of the ancients has forfeited its intersubjective relevance and imaginary potency. Community no longer hinges on communing: Algorithmic Gate-Keeping is taking command. This paper sounds the bell for a new approach to envisaging social cohesion based on the notion of an "*algora*," a term coined to describe a state of affairs that has a longer, largely overlooked, philosophical pedigree. The history of cognitive ideation is also the history of "mindscapes." They are occasioned by the conjuncture of technology and language, an insight articulated by Kant, formalized by Turing and now practiced by the global citizenry of users, daily hammering out on keyboards what this means in practice.

Keywords: Cyber-Kant; Mindscape; Algora; Public Space; Philosophy of Mind; Turing Imitation Game; Reason as Composition

Аннотация
В этом эссе для первого выпуска журнала *"Технологии в инфосфере" ("Technology and Language")* описывается, как мы живем в публичном пространстве в традициях Просвещения и в условиях современных кибер-технологий. Легендарная агора древних утратила свою интерсубъективную значимость и воображаемую мощь. Сообщество больше не зависит от общения: контроль берет на себя алгоритм. Эта статья является сигналом к новому подходу к представлению о социальной сплоченности, основанному на понятии "алгоритма" – термина, придуманного для описания положения дел, имеющего длительную философскую историю, в значительной степени игнорируемую. История когнитивного мышления – это также история "лабиринтов разума". Они вызваны соединением технологии и языка, предвиденным Кантом, формализованным Тьюрингом и ныне осуществляющимся благодаря участникам глобального государства, ежедневно выясняющим на клавиатуре, что это означает на практике.

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A(l)gora: the Mindscape

I.

Public space was privatised while our philosophers were busy doing other things. What was once the *agora* of the ancient Greek city-state has morphed over the centuries until it was supplanted, recently, by an *algora*, if you will, owned and upheld by a bloc of global media empires. No longer a bounded place, the *algora* resembles an extancy amorphously transacted online and steered by algorithmic gate-keeping. Pandemic *ersatz* sociality has pushed the transformation front and centre: the immediacy of anonymous proximity associated in its purest form with the agora – and in derivative application with the temple, the church, the museum (both in classical and modern conception), the theatre, the restaurant, the cinema, the gym – has given way to a new modality of being alone together (euphemistically, called "connection," "connectedness," and "connectivity"), a synchronized isolation marked by the ineluctable surveillance that has been built into the system.[1] We are left with a two-tiered oxymoron: *a private public space with no locality*. Will these new arrangements deliver the insight and sagacity we have come to expect and rely upon for the conduct of social affairs? How will we know if the life-sustaining metabolism of consensual sanity is no longer properly, sufficiently and reliably self-correcting? And most importantly, perhaps, where shall we turn for guidance if said *agora*/*algora* phase-shift turns out to be detrimental to our deliberative processes, and radically disruptive of the cognitive tools and dexterities on whose sound functioning our techno-scientific civilization, fragile in its sophistication, has come to depend?

This would be a fine question to put to a contemporary philosopher but for the complication of historical reflexivity: Western philosophy – a branch of aesthetico-political shamanism which in its most orthodox, disciplinary formulation is especially partial to the regulative function of societal congregation – traces its origins to the very public space that we take to be metonymic for the practices of reason established in the pre-digital era, namely aforementioned agora. In the absence of this organising principle, it is unclear how we might resolve, collectively, wherein new operative standards of rationality consist. Philosophers of the agora discharge the performativity of reason before a live and semi-cohesive audience in the referential matrix of spatial embodiment and gestural signification. To philosophize with, through and by means of the *algora*, by contrast, amounts to a feat of epistemic pioneering akin to navigating the open sea without compass or map. Of course, it is possible to settle into the delusory comfort of projecting the agora onto the *algora* – as the user interfaces at every access point of our quotidian deep dives into cyberspace encourage us to do. This allows the prospectors, namely all of us, to read the old into the new and, specifically, to impute speech acts to a mimetic machinery that is merely giving a good impression of actualized intentionality. The danger here is that the false conception will likely preclude any strategic and calculated course correction.

Today's *algora* reaches everywhere and nowhere. The logic of spectatorship is reversed with respect to the former idiom of corporeal communication; digital infrastructures stalk their users' every action and inaction. We are the unwitting

[1] For incisive analysis of the political consequences, see Zeynep Tufekci (2017).

performers in this arena, continually replicating our own agency. There is no audience, a notion from the trope of theatre and museum, more public spaces rendered defunct by pandemic and digital transformation. Instead, attention scatters through the interstices of mediated communication and spawns an emergent, distributive, composite and heterogeneous field of sensory activity, in short, not only a "techno- or mediascape" (Appadurai, 1990), but a vast and amorphous mindscape (Xylander, in press), where public and private are hopelessly entangled. In addition to the platforms being proprietary, commercial venues – that is to say *private* assets – the very distinction that the public/private dichotomy conjures has been rendered obsolete. *Public patterns* are calculated by culling *private judgement calls* aggregated on the fly while *private stirrings* answer to imperceptible *public nudgings* (Couldry & Mejias, 2019*)*. This dynamic recalls autopoiesis although they are prodded by determinist protocols of command lines with an admixture of heuristic spontaneity. Such procedural doings generate a most precious albeit essentially artificial commodity, namely datafied agency, a novel resource of consummate ideality whose value chain depends, signally, on concealment, or in other words *public privacy*. This is not a necessary feature of the system. It is a perversion we are complicit in sanctioning through regular use.

II.

Why launch a journal called *Technology and Language*? We associate technology with engineering and manufacture, language rather with the humanities and contemplation – worlds that appear to be further apart today than ever before.[2] Pundits peddling the clash of cultures lament that the divide between *téchne* (craft, art) and *logos* (word, knowledge), laboratory and study, hand and head is driving the loss of felt meaningfulness and a general decline of values in the Western world. There is a growing cabal of celebrity culture warriors earning their keep online as influencers and digital spin-doctors with this lucrative narrative of fissure and decline (Ruoff & Xylander, 2020). The remedy to this trending divisiveness, they would have us believe, is the embrace of ideological adhesives, causes that purport to unify community around covenants of sectarian "identity" (be they gender, race, sex, or blood and soil, and devotion to a charismatic leader or other varieties of ethnic exceptionalism),[3] or around esoteric invocations of "wholeness" (Horn, 2020). But is this, perhaps, a misleading line of argument? Do such descriptions of the malaise perpetuate the very syndrome that these agitators foment?

Taken alone, the title *Technology and Language* conjures new media environments with their sundry *ersatz* engagements, liminal actualities and iterative routines. "Duolingo" comes to mind, "Babbel" and untold other Apps widely in circulation – online services for the learning of foreign tongues in the age of digital tuition. Such stirrings typify modalities of enculturation that bring into effect new patterns of anthropogenesis without ever occasioning displacement, mobility or friction of any kind. Virtualized armchair globe-trotting for, shall we say, everywoman and everyman and every LGBTQ+person. Brain exercises said to stave off dementia. The philosopher's guide through the galaxy can begin right here. While language acquisition is certainly relevant

[2] For a discussion of this cultural divide as reflected in the orthogonal "literacies" of paper – writing paper vs. industrial paper, see Xylander (2017).
[3] Kenan Malik (2019) notes that it is considered progressive to pursue politics in the name of disadvantaged groups, be they transgender, muslims, or women.

to the field at issue, of central interest here is not massively online multiparticipant cyborg pedagogy. Nor has the disjunct spurred the editorial inspiration: this journal is not about technology *or* language; these should not be considered optional alternative lines of enquiry or simply domains of complementary activity. This digital journal – with its purposive attempt to reimagine the classical public space of the *agora* under the brave, new, twitterfied conditions of the distributive tiktok talk making up the *algora* – seeks to articulate the conditions of possibility for a disinterested conjunction of the two. What is it about technology *and* language that might warrant special claim on our attention? And why should said concomitance preoccupy us at the present time not just for the duration of an essay or the length of a monograph but on an ongoing basis over consecutive issues of a quaint throwback, a scholarly journal, in the guise of an online hub for opining?

The answer lies in the recent convergence of technology and language as generative potentialities fostering cognitive surplus value. With the Universal Turing Machine, technology has been abstracted into a generalized model of its own functioning; mechanical appliances have been usurped by the grammar of their problem-solving logics. Nanotechnology has turned material science into hermeneutic exegesis: we need only recall the parabolic presentation of IBM inscribing itself into the elemental structure of matter itself by means of atomic self-issuance (Nordmann, 2006). Scriptural authority has been delegated to particle physics while the Universal Turing Machine – today a constant companion of average punters in the oft touted Free World, though certainly not free from software entanglement, from as early as the age of three onwards (Auxier et al., 2020). The internet of things reverses the relative priority of "actants," to speak with Latour (1996); a networked surround on which humans intermittently interpose their attenuating presence dominates.[4] Ironically, "anonymity" is most highly prized where it has been effectively obliterated by design, namely on the internet.[5] Optimization as governing principle: With the ever-increasing scale of automation has come a shift in the locus of supervisory steering functions, what Shoshana Zuboff (2019) calls "surveillance Capitalism." The wiles of reason, once by-product of engaged human assembly, both anonymous and deliberative, are being usurped by the iterative calculus of recursive emulation – how things were done in the past bootstraps and benchmarks the fractal archaeology of future marginal action. The sweeping indexicality of today's information architecture is re-formatting late enlightenment subjectivity, which was partitioned according to the dictates of individuated personhood (Foucault, 1966/1970). Future philosophy of mind will parse differently.[6] As intelligible decision-making becomes manifestly less anthropocentric, the interpretative proscenium of the romantic self will likely succumb to a hybrid idiom of self-regulating incre*mentality* based on human-machine interactions where, and this is the crux of the journal, *Technology and Language* form a continuous concurrence.

[4] Peter Weibel's "Streaming Festival" can be understood as a performative philosophical exploration of this digital turn with its attendant social adjustments. Due to pandemic lockdown, the official opening of the "thought experiment" (*Gedankenexperiment*) he curated together with Bruno Latour for the ZKM Karlsruhe, "Critical Zones," had to be postponed. Weibel took the exhibition online – and turned it into a test run of alternative public spaces. For a review of the streaming festival see Xylander (2020).
[5] The Electronic Frontier Foundation (EFF), a forceful lobbyist for internet anonymity, offers a rationale in an online mission statement on Anonymity (Anonymous, n.d.). For political contextualization of the EFF see Levine (2018).
[6] For a related argument based on the transformative impact of recent film culture see Denson (2020).

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Our first task is not healing the rift between the apparatuses and their operators. We must take stock of the loss of a meaningful demarcation between organic and inorganic purposiveness. Alan Turing's (1937) "On Computable Numbers, with an Application to the *Entscheidungsproblem*" reduces the design of problem-solving to combinatorial tables of inputs and outputs. His later essay, "Computing Intelligence and Machinery" (Turing, 1950) correlates the totality of discrete state machines that comprised mechanical processing on the Victorian factory floor with the "digital computer." He reminds the reader that before artificial intelligence contracted into the semiotics of the digital, it articulated itself in the coordinated cadences of industrial manufacture. Mechanizing the means of production involves automated problem solving, that is to say an instrumental enactment of purposive action, in short, applied reason. Turing famously equates intelligence to an "imitation game," which quite pointedly does not consist in a human pretending to be a machine, a scenario that would end with a knock out in round one (Turing, 1950, p. 434). Instead, the imitation game calls for the machine to dissemble, to make like its human counterpart, to act actually human. Yet, the contest does not consist – as usually maintained – in the machine's feigning blanket humanness. The imitation game is scripted more exactingly. Its scenography is alluringly hybrid, fluid and recombinatorial.

The "digital computer" qua Turing is precisely *not* simply humanoid in semblance; it simulates *embodied humans*. To begin with, he imagines the contestants of the imitation game to be gendered, namely a man and a woman. The man pretends to be the woman and an external interrogator attempts to identify who is who (Turing, 1950, p. 433). For the next round of the imitation game, one player is replaced. It happens to be the man. Now the contestants are, on one side, the woman from the previous round and, on the other, a machine pretending to be a man pretending to be a woman (Turing, 1950, p. 433). Turing cycles through various castings of these roles. Elsewhere in the essay, he summons two technological contestants: an actual piece of manufacturing equipment, on one side, and a digital computer pretending to be a programmed automaton pretending to be a mechanical device, on the other (Turing, 1950, p. 440). His imaginary dramatization of mindful action is every bit as transmutable, phantasmagorical and kaleidoscopic as this may sound. Go read the original. Turing's transcendentalism evokes a transgender, nonbinary utopia.

At the end of what reads like a brilliant polemic against brain exceptionalism, Turing takes the imitation game to its logical conclusion. In the final round, we revisit the earlier match between the machine pretending to be a man pretending to be a woman, for one, and the original woman, for another; she is now replaced by a digital computer (Turing, 1950, p. 441). We are left with the unsettling impression of two dissimulating automata – subtly differentiated at machine-level specification – who now compete against each other for a mantle of spurious authenticity that has no sensory relevance. All that remains in view are imitative routines fuelled by the ingested remnants of obsolete identities, gendered or otherwise. Intelligence, in this conception, amounts to the simulation of intelligent behaviour, be it by humans or machines. A radically constructivist cognitive paradigm where the very parameters of agency are up for grabs. No longer bounded by corporeal or sensory givens, agency would then arise as pure immanence from transactions occurring in a matrix of co-incidence and its antecedent contingencies.

Technology and Language sounds innocuous enough, even non-committal. It invites you to free associate on technology as a linguistic practice with its own grammars, semantics and inflections and on language as a cognitive technology. Such deliberations could fill numerous issues without admitting to what is ultimately at stake, namely the question of philosophy itself. Taken as a logical quantifier, the conjunction commits us to a quest for what technology *and* language have in common – and that, I submit, is a peculiar reliance on and furtherance of the philosophical ground of the means by which cognition materializes as a force able to shape the composite that is reason.

III.

Reception histories can perpetuate distortion. The German philosopher Immanuel Kant (1724-1804), a pioneering theorist of public space and the distributive mechanics of reason and judgement, is widely revered as an advocate of the capitalist bourgeois subject (Pinker, 2018, p. 24).[7] He has been portrayed as its most persuasive spokesman, its cardinal champion. Rightly?

Let us consider the following account of the history of ideas casting Kant as the primogenitor of reason as composition. His program was elaborated in many different keys: there is its material application to worldly circumstance in fiction, see "On the Marionette Theater" by Heinrich von Kleist (1777-1811); it informs the quantitative theorizing of psycho-mechanics, see the real-idealism of Johann Friedrich Herbart (1776-1841); it is at work in the gospel of resistance forming the essence of war and peace, see the writings and military career of Carl von Clausewitz (1780-1831); and it can be found in the mathematics of infinity, see David Hilbert (1862-1943) who posed the "*Entscheidungsproblem*" referenced in the title of that momentous essay, which led Turing to zero in on the blueprint for an eventual laptop of the kind on which I am writing this essay. And for the digital platforms via which this essay will be distributed to you. And for the sundry devices that will allow you to download or directly access these reveries reverberating in an encrypted plenitude of enregistered signs.

The point is that under the radar of academic philosophy, there runs a genealogy of applied ingenuity arguably more Kantian than the received Kant of the lectern insofar as it highlighted the anarchic and protean quality of reason in its historical contingency arising from ways of being in the world we are thereby making, be they situated or ephemeral.[8] On this reading, Kant masterminded a conceptual arena that enabled a novel understanding of cognition, one that would eventually pave the way for the design and rise of the information technologies cluttering the built habitats of the 21st century. He traces the inner life not to divine spirit but rather to a morphogenetic confluence of forces in the world, an epistemic epigenesis, if you will, where intelligible form emerges from the plethora of practices – manual, social and mental. Since applied Kant leads rather directly to the cognitive sciences with their engineered contrivances, it should come as no surprise that Kant's moral philosophy may be uniquely suited to apprehending the metamorphosis of *agora* to *algora* and to grasping consequent ethical implications for ordering public/private affairs. Kant may not be the supreme apologist of modern individualism after all. He may turn out to be a digital innovator *avant la lettre*, a

[7] For a critical deconstruction of the ideological premises informing this reception history see Riskin (2019).
[8] For a masterful demonstration of this down-to-earth Kantianism as reflected in Clausewitz's applied philosophy of war see Caygill (2013).

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posthumanist oracle invoking always an already imaginary trope of reason that each of us enlists to enact our respective simulation of reason while the mereology of co-ordinations presents a phantasm of ambient intelligence (Lando, 2017).

This is not the place to dwell on why or to what extent Kant's conception of reason may have been lost in the shuffle. Let us note for the nonce that his seminal 1784-essay in the *Berlinische Monatsschrift* equated the very definition of Enlightenment to the drawing of a clear distinction between public and private acts of deliberation – and, what is more, safeguarding the boundary between them (Kant, 1784a). Indeed, Kant famously inverts their relative valency by casting private judgement as institutionally compromised and biased while pitching public judgement as the true domain of negotiated comprehension and intersubjective verity (Foucault, 1966/1970). His philosophical system was penned with an exemplar of artificial intelligence "in the room," namely von Kempelen's "Mechanical Turk." An essay by Johann Erich Biester on this automaton appeared in the same issue of the *Monatsschrift* as did Kant's essay – indeed the two pieces were adjacent and cross-referenced, as Simon Schaffer (2001) shows. Make no mistake: Kant was engaging period AI. That other essay was entitled "Remarks on von Kempelen's Chess-playing and Conversation Automaton" (Biester, 1784). Yes, it was a trick, a human player was hiding in the contraption and initiating the moves that were being played by the Turk-styled, mechanical puppet. But, as Schaffer unpacks, the device was so ingeniously constructed that it took 80 years before the human operator's secret hiding place was finally revealed. Meanwhile, the performance delivered by the Mechanical Turk for the audience of the *Berlinische Monatsschrift* featured an automaton beating the likes of Benjamin Franklin at chess (Standage, 2002), a display of virtuosity reminiscent of IBM's Deep Blue beating Kasparov in 1997 (Hsu, 2002). Kant's peers debated the veracity of Kempelen's sensational achievement and doubted that "wood can think," so Biester enunciates the disbelief in automated reason. But Kant arguably discerned a revolutionary subtext to the aesthetic object lesson, spotting behind the fake a performance of autonomous artificial intelligence, one that has become paradigmatic; its archetypal instantiation. And he seized the challenge presented by this early, courtly *imitation game* to reflect on the far-reaching implications of such clever accoutrements that mimic humans who, in turn, are play-acting – the very insight eventually codified by Turing.

Kant's *Critique of Pure Reason* inaugurated a new conception of epistemic practice, one that opened the way for parsing subjectivity into mechanical and sentient, quantitative and qualitative, particulate and composite apparitions (Kant, 1781/1787). What is more, the subjectivity Kant articulated had dimensionality, its notional agency scales from embodied selfhood to transcendent personhood. Kant deemed hybridity foundational to human self-development. His theory of mind arguably opened the floodgates to the digital disruption engulfing us at present. Suppositional postulates underlying the Universal Turing Machine were conjured in East Prussia (Kant's domicile), so the claim, and this nascent context gives his Transcendental Idealism elevated relevance as we grapple with the vast proliferation of Turing-devices that form a ubiquitous web of connection. Kantian ethics – a cardinal example of how technology and language dovetail – can be enlisted in taming the manifold public consequences of the augmented privatisations, both phenomenological and proprietary, of digitality. I have called this research agenda

"Cyber-Kant."[9] It holds that contemporary smart infrastructure operationalize a military-industrial complex of applied engineering prowess,[10] hinging on a quintessentially Kantian insight, namely that human instrumentality and human freedom are conjoined, at the hip, as it were, like the girl and fish of legend.

Kant studied – and aimed to ameliorate – human affairs from his hometown of Königsberg, a bustling port town and major trading station on the Hanseatic fringe of global trade routes at the time (Nokkala & Miller, 2019). He deemed it the ideal vantage point from which to rid the world of superstition (Kant, 1798, p. 4). What he knew of the world, beyond the Baltic Sea basin, came from his voracious appetite for news. The appointment of his library sustained a copious diet of natural history and travel books. Our philosopher was the consummate armchair globe-trotter. His prolific exchange with a worldwide scholarly community left traces in journals and letters, and codified the workings of the public sphere (Habermas, 1966/1990, p. 42). Friends and acquaintances report that he mingled with persons of all stations: aristocratic, learned, commercial, artisanal, military and menial. Living where he did and as he did – the biographical literature on his quotidian routines is abundant – he was also steeped in the cosmopolitan chatter of nautical culture. This can't be stressed enough – sailor lore is the salt air Kant breathed.

And seafaring, in fact, does constitute a recurrent theme of his reveries. In "What Does it Mean to Orient Oneself in Thinking" Kant (1786) transplants the navigational expertise used for geography in general and sea travel in particular to the navigational self-enquiry of not losing one's line of thought in the infinite abstracts of time and space. For literary theorist Helmut Müller-Sievers (2015) these techniques for coordination log the inherent "homelessness of the Kantian subject." (p. 96). Allusions to commercial trade and distant colonies are frequent. "Perpetual Peace" – Kant's (1795) essay consulted in drafting the United Nations Charter – speaks of atrocities on the Sugar Islands perpetrated by colonial occupiers so ruthlessly exploitative in the commercial appropriation of native resources, natural and human, that they defy not only "civility" (*Sittlichkeit*) but every possible construal of civilization, and this includes his allowance for "unsociable sociability" (*ungesellige Geselligkeit*) (Kant, 1784b). Unlike most colonies, this one turned no profit. The outpost was used solely for naval training; it churned out sailor-soldiers for hire. An archipelago of human clustering that serves one sole purpose: to supply cannon-fodder. Culture reduced to killing machine. Beyond exemplifying untold cruelty, such an enterprise is quite literally unsustainable. The practices on this island expose a nihilism so boundless that it erodes the reproductive capacity on which the human enterprise depends. His morality is not normative so much as illustrative. Kant enjoins us to act in ways consistent with the arithmetic import of our actions, a calculus that operates beyond the heterogenous ken of our limited lifespans and restricted perspectives. It was a mindset likely honed by his lifelong engagement with the

[9] See the text for the exhibition „Open Codes?" at the Kunstraum of Leuphana University (Xylander, 2019), and for the wider digital theoretical context the exhibition "Open Codes" curated by Peter Weibel at the ZKM Karlsruhe (Weibel, Xylander, & Krümmel, 2019).

[10] For an incisive account of the military-industrial origins of the internet see Levine (2018). This distinctive confluence of reasoning strategies in the service of revolutions (philosophical, political, military) – what Alfred Nordmann in this collection of essays subsumes under "technosphere" and "infosphere" – can be traced to the Prussian context in which Kant's critical philosophy appeared, and its aftermath.

diversity of peoples and cultural formations articulated in books and the tidings of mariners, young and old.

IV.

As we shift from the *agora* to the *algora*, it behooves us to reimagine with Kant the inner connection of technology *and* language. His insights into yonder lifeworld are strikingly apt for informing how we grasp and respond to our tech predicament today, namely how to orient humanity in an imagined public space compromised by privacy's privations.[11] Distal communication has existed since smoke signalling and yodelling were discovered – the new quality of the *algora* is not remoteness of communication *per se* but its illusory intimation of vicinity. While the "tacit knowledge" (Polanyi, 1958, 1966) associated with institutional proximity of old is lost in the shuffle of new-fangled approximations – with the online university being a prime example of pod-tending in lieu of associating – the challenge this poses for deliberative reasoning and imitative cognition are abundant. How to circumvent infinite regression? These fragments offer a first charting of the waters. A more sustained navigation will follow in a future issue of *Technology and Language.* For the moment, the siren's song and the mermaid's tease must suffice.

Cheryce von Xylander

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[11] For an exploration of the philosophical premises informing these technical arrangements see Daub (2020).

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