

# Humboldt's Vision of a Smart(er) World

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## ABSTRACT

In the 19th century Alexander von Humboldt explored the nature and was conceived a new vision of nature that still influences the way we understand the new world. Humboldt believed in the importance of accurate measurements and precise description of observations. His vision of nature included not only facts but also emotions.

Nowadays smart solutions will be developed by using computer technology, which will influence our relationship to nature, our handling of the complexity and diversity of nature itself and the technological influences on the society. Could we avoid a new form of “Colonialism”, when a network of super computers will create a smarter world?

**Keywords:** Alexander von Humboldt, Nature, Artificial Intelligence

## 1. INTRODUCTION

The German scientist Alexander von Humboldt viewed the natural world holistically and described the harmony of nature among the diversity of the physical world as a conjoining between all physical disciplines [1]. Even after more than two hundred years he is admired for his ability to see the natural world and human nature in the context of a complex network of relationships [2]. But the complexity and interconnectedness of information in his works are neither visible in his writings nor in document-oriented digitized content [3]. Humboldt's emphasis on interconnectedness can be gauged by some of his images and drawings, which document natural processes and correlations.

Humboldt believed in the importance of accurate measurements and precise description of observations, which should be measured by using the finest instruments and techniques available, to detect processes and phenomena in a better way. This collected data was the basis of his scientific understanding [4].

Technology and Computer sciences are evolving enormously. They influence our daily life more than ever. There is no example of such an explosion of knowledge, communication and computer applications ever in mankind and many questions about how we can design the future arise. One of the main

questions deals with our relationship to nature, our handling of the complexity and diversity of nature itself and the technological influences on the society.

In the 19th century Humboldt faced similar challenges, because he explored the nature and “was conceiving a bold new vision of nature that still influences the way, how we understand the new world” [5]. He exceeded limits of the known world, travelling to the Americas and outermost parts of Siberia and developed concepts of a scientific approach for the natural sciences. In terms of information technology he founded the procedural thinking to describe his view of nature, because he found connections everywhere even between the animated and inanimated nature. In this great chain of connected effects he remarked that no single fact can be considered in isolation. „So he invented the web of life as we know it today“ [5].

## 2. CURRENT CHALLENGES AND DEVELOPMENTS

Because of today's fast growing population and the emergence of super cities the demand for intelligent and sustainable environments has increased. To offer a high quality of life and to reduce the environmental impact the idea of smart cities was born. The intention behind is to bring together technology, government and society [6].

One of the challenges is the need of intelligent algorithms to analyze and concatenate the huge amount of collected Big Data produced by e.g. smart cities and smart production. On basis of that information, intelligent and automated “decision makers” have to control all related processes.

There are still warning voices on dangers of the artificial intelligence and advanced computer technology.

A substitution of humans by supercomputers is unlikely for Messerly [7], because humans are not digital or biological computers and they are unlikely to be replaced by computers anytime soon. And Schlieter stated [8] that it would be naive and dangerous to ignore a technical development, which is aiming to human's live conditions and which will be autonomous in the nearest future.

Stephen Hawking [9] expressed his believe in a BBC interview, that „there is no deep difference between what can be achieved by a biological brain and what can be achieved by a computer. It therefore follows that computers can, in theory, emulate human intelligence — and exceed it."

That could help us but „could also bring us all sorts of things we didn't like - autonomous weapons, economic disruption and machines that developed a will of their own, in conflict with humanity.“

So he pointed out, that the computer and the artificial intelligence will be either the best or the worst thing ever happen to humanity. „We do not yet know which."

Helbing [10] asked questions, if we have to expect a smart nation or a smart planet, when we will suffer smartphones, smart homes, smart factories, and smart cities. And what does that mean, when artificial intelligence will not be programmed by humans line by line but automatically by the computer itself with continuous progress of optimization? Their study led to tthe prognosis that within the coming 40 years computers will exceed human capabilities with possible the consequences for the society.

A different, not negligible aspect is the security of the system. When everything is interconnected (cloud), then everything theoretically can be manipulated or attacked by different threats. Such systems have dependencies to power sources and the internet connection and have to be redundant and fail proofed. Another factor that is worth thinking about is the safety of everybody's personal data that has to be guaranteed.

### 3. THE HISTORICAL DIMENSION

#### Artificial intelligence

Our relationship to the world is defined by intellectuals and we are shaped by the past [5]. For example Nicolaus Copernicus discovered astronomical data and observed to the universe. Isaac Newton found laws of nature and Charles Darwin proved that all species descend from common ancestors. Stephen Hawking explored the universe and discovered the black holes. And what is the concept of nature itself? Humboldt described his view and gave us an idea of nature. It can be explored and discovered not only by facts and processes, but also on emotional basis! He believed that a great part of our response to the natural world should be based on the senses and the emotions. When other scientists searched for universal laws, Alexander von Humboldt wanted to excite a love of nature! He wrote that nature had to be experienced through feelings.

On the other hand, artificial intelligence today is dealing with Big Data and algorithms to make decisions by data analysis and pattern recognition. Everything is happening on a logical level. But there are no solutions for artificial emotions.

Whatever we will develop on computers, even systems with decision algorithms and self-determination, we shouldn't forget Humboldt's idea of nature.

#### Communication

Humboldt corresponded with the inventor of the telegraph Samuel Morse after seeing his telegraphic apparatus in Paris in the 1830s. Morse reported back on his experiments regarding a subterranean line between Ireland and Newfoundland [5]. Humboldt was extremely interested in a communication line between Europe and America. He thought this could allow him to get instant answers from scientists on the other side of the Atlantic to promote the sciences. He insisted in scientific communication, which gave him options to discuss phenomena, observations and measurements. He was the nexus of the scientific world, but felt unrelentingly persecuted by his own correspondence, receiving more than 4000 letters a year and writing 2000 letters himself. He didn't like private secretaries, because dictated letters were too formal and business-like [5].

Of course he had no idea about the Internet services and communication tools but he would have appreciated it as a personal communication channel!

#### Technical solutions for a better life

Humboldt was a fierce critic of colonialism, after he saw the devastating environmental effects of colonial plantations at Lake Valencia in Venezuela . He described the forest's ability to enrich the atmosphere with moisture and its cooling effect and warned that humans were meddling with the climate with unforeseeable impacts on future generations. It was the first time in history a scientist talking about sustainability. And he pointed out technical solutions for a better world with sustainable use of our resources.

### 4. CHALLENGES OF A SMARTER WORLD

It is difficult to correctly assess the impact of technological development on the future. In particular, the impact of artificial intelligence on our efforts to protect the environment and changes in society are difficult to predict. We should therefore consider Humboldt's visions of nature and draw our conclusions about what the smarter world might look like in the coming decades. Assuming an increasing development of artificial intelligence, we must already ensure today that the main concern of computer-controlled life is sustainability and the pursuit of an improved quality of life on our planet Earth. Anything else would ultimately lead to "technical colonialism" if a network of supercomputers created a more intelligent world.

One of the threats lies in the intelligent algorithms to analyze and link huge amounts of data, such as those produced e.g. by smart cities or smart production, as automated decisions have to be made on this information basis for all associated processes. But the complexity of the algorithm increases its opacity! The more advanced the self-learning processes of neural networks are, the less their users can control the learning outcomes generated by those networks, which in turn makes the autonomously acting computers uncontrollable. So Helbing [10] warns that, ultimately, privacy, human dignity, and other

principles of fairness and justice will yield to a new arbitrariness, because those underlying algorithms cannot operate completely without errors.

Is this a challenge our next generations have to deal with?

## 5. CONCLUSIONS

Smart solutions will be developed by using computer technology not only for protection of resources or better communication, but for a higher quality of life on our planet. Humboldt would absolutely agree. But he gave us an idea of nature itself, describing processes and interconnections between animated and unanimated nature. He was the nexus of science at his time, communicating and supporting scientists all over the world for better understanding of the nature. But his vision of nature included not only facts but also emotions.

It has to be pointed out that a replacement of humans by computers is unlikely, because human thinking is characterized by cognitive heuristics and emotions, which cannot simply be implemented in machines operating with algorithms, procedural data processing or artificial neural networks. But the main challenge in the age of digitization, Big Data and autonomous systems is the situation that those systems have developed a "life of their own" in a metaphorical sense, in order to make the world "smarter". And all this is also served to us with a dash of safety promise and environmental awareness, because we save energy with "smart grids", drive risk-free with "smart cars" and live well-protected in "smart cities".

In the sense of Humboldt it would be similar to technical colonialism, if high developed computer intelligence brings us a smarter world with machines which developed a will of their own in conflict with humanity.

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