

## Media communiqué

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***SATW and Empa begin discussions on the ethical aspects of converging technologies***

### **Nano-Bio-Info-Cogno: When scientific disciplines melt into one another**

***In the modern scientific world the traditional boundaries between individual disciplines are becoming less and less distinct. In a truly interdisciplinary environment different scientific branches fuse together. This trend is particularly noticeable in the boundaries between nano, bio and information technologies, as well as those of the cognitive sciences. Implantable microchips, which, thanks to nano know how, can communicate with the body's cells and transmit data on to a computer, are but a single example of this. At the invitation of the Commission for Ethics and Technology of the Swiss Academy of Engineering Sciences (SATW), about thirty experts in the field met in mid November last year to discuss the convergence of «Nano-Bio-Info-Cogno» and the ethical questions this trend is raising. One such question is whether the human being can and should be “improved”, and under what conditions such changes might be permissible.***

“The idea was to identify the most important ethical questions involving convergent technologies, with the aim of covering individual ones in more detail in further meetings,” explains Ulrich Lattmann, Chairman of the Commission for Ethics and Technology of the SATW, and organizer of the Workshop. This “homework” is now waiting to be done, the first meeting having provided enough raw material for this purpose. One reason for this was that the participants, appropriately enough given the subject under discussion, came from a range of very different disciplines. Lorenz Hilty, head of Empa’s Technology and Society Laboratory and host of the event, was very pleased that all four Swiss scientific academies – the Swiss Academy of Sciences (SCNAT), the Swiss Academy of Medical Sciences (SAMS) and the Swiss Academy of Human and Social Sciences (SAGW), plus of course the SATW – took part in the discussions. “This meant that we had a truly interdisciplinary meeting,” Hilty felt.

#### **Transhumanism – attempting to “improve” the human being**

There was no shortage of controversial questions to discuss. Where does therapy end, and where does human manipulation begin? Or under what conditions is the intentional influencing of the human consciousness desirable, when is it not? What are the consequences for us when every item in our environment is “intelligent” and networked together – that is, when we have created and live in an “internet of objects”? The example of “human improvement” showed the difficulties inherent in the subject. “As long as we talk about medical therapies, then an ethical obligation to heal exists,” opines Hilty. “So far, so good, but often there is only a narrow, ill-defined boundary between therapy and improvement.”

The thrust of the workshop was, however, that although technical progress will create opportunities in future which until a few years ago sounded like ideas from science fiction, many of the associated ethical questions are anything but new. “Attempts to “improve” man are practically as old as mankind itself,” maintained Anders Sandberg of the Uehiro Centre for Practical Ethics at Oxford University, for example. Sandberg is also a participant in the EU financed ENHANCE project, which deals with the ethical and philosophical questions of so-called transhumanism. The Babylonian Epic of Gilgamesh, the oldest novel known to

mankind, deals more or less with the subject of immortality, “the ultimate human improvement, so to say” in Sandberg’s opinion. Here too, the boundaries are not as clear cut as one might think. “When we drink coffee, the caffeine enhances our power of concentration. Having said that, very few of us think of having a drink of coffee as an example of human improvement,” says Sandberg. When dealing with cognitive enhancing drugs such as the psychostimulant Modafinil, the case is much clearer. This medication, which was originally developed as a treatment for narcolepsy, is today used – “off-label” and against recommendations, of course – to increase the ability to remember by students prior to taking an examination, for example.

### **Focus on the interface between man and the ever more intelligent machine**

In the area of interfaces between man and machine also the future has already begun. “In a club in Barcelona, guests can have a chip implanted into their body which acts as an entrance ticket and pays for their drinks,” reported Arie Rip, an expert on assessing the effects of technology from the University of Twente. “This is a pure lifestyle issue, and the first step toward computer-readable humans.” On the subject of computers, how they already today influence us, even without the effects of technical convergence, is demonstrated by various studies of children who spend a lot of time playing computer games, according to Sandberg. “Computer games affect our ability to see,” is Sandberg’s conclusion. Children who frequently play computer games show enhanced peripheral vision. “Whether this is good or bad only time will tell,” says the Oxford scientist.

The relationship between man and (more or less “intelligent”) machine was a recurring topic of discussion that took centre stage. For Torsten Fleischer of the Institute for Technology Assessment and Systems Analysis at the Forschungszentrum Karlsruhe, converging technologies deal with the integration of mankind in an increasingly technical environment. In other words, how man can – and must – communicate ever more efficiently with the machine. “This demands an answer to the question of who must communicate with whom,” according to Fleischer. Karl Knop of the SATW has a similar viewpoint; converging technologies make the boundaries between live and non-live nature in a certain sense more transparent. “The ethical challenge is, in my opinion, the following: should we break through this barrier without thinking very carefully of the consequences?”

### **The goal: a kind of «Ten Commandments for Scientists»**

In the end, at the conclusion of this first workshop, everyone was agreed that for future meetings instead of abstract discussions about ethics the focus should be on more tangible applications such as brain stimulation, smart materials or new identification and monitoring technologies. Based on these kinds of topics, concrete recommended actions should be worked out. “What we need is a kind of Ten Commandments for Scientists, a set of guidelines on what is perceived and accepted as good, correct practice,” summarized Thomas Stieglitz, a specialist on biomedical microtechnology at the University of Freiburg im Breisgau.

### **Further information**

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### What are converging (or convergent) technologies?

The catchword “converging technologies” refers in general terms to a strongly interlinked range of scientific disciplines, a fusion or melting together of different technologies. In a narrower sense the convergence refers to four scientific and technological areas of central importance: nanotechnology, biotechnology, information technology and cognitive science. The US National Science Foundation organized the first convergence meeting in 2002, with the title «Converging Technologies for Improving Human Performance». This meeting focused on the potential of convergence for greatly improving human capabilities, performance in society and quality of life. It also gave rise to the now accepted abbreviation «NBIC» convergence, for Nano-Bio-Info-Cogno. In contrast to the mainly techno-optimistic mood of the USA, in Europe voices were heard pointing out the risks involved with areas of science whose boundaries were melting together. To reflect these concerns the abbreviation BANG was coined, derived from the initial letters of the “raw materials” of the individual disciplines – bits, atoms, neurons and genes.



Prof. Dr. Lorenz Hilty, host and Head of Empa's Technology und Society Laboratory.



Ulrich Lattmann, Chairman of the Commission for Ethics and Technology of the SATW and organizer of the event.



There was no shortage of controversial issues for the participants to discuss, even during the breaks!