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●目覚ましい発展遂げる神経科学

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今年のワールドカップでは下半身不随の男性がボールを蹴って開催が宣言されたが、これは男性の脳から直接制御されるデューク大開発のロボット外骨格を使ったものだった。

このように神経科学は近年、大きな進化を遂げており、fMRI、EEG、PET、DBS、CAT、TCM、TES といった最新技術を駆使して、脳内の活動をより精緻に観察することも可能になっている。

国防総省はイラクやアフガニスタンでの戦傷者を支援するため、最新の義肢を開発する「Revolutionary Prosthetics」プログラムに1億5000万ドル以上を投入している。

また昨年にはウェイク・フォレスト大と南カリフォルニア大の研究チームが映画「マトリックス」のように作業記憶を記録し、マウスの脳に直接アップロードすることに初めて成功。これはアルツハイマー患者の記憶再生等への応用が期待されている。

この分野がさらに発展すれば感情や知覚、記憶などをインターネットで転送する「ブレインネット」の実現も夢ではなくなる。すでにカリフォルニア大学バークリ―校ではMRIデータを分析して、撮影当時の思考をある程度まで再構築することに成功している。

神経科学の目覚ましい発展は政治家の関心も引いており、EUと米国は合わせて10億ドル以上をこの分野の研究に投入することを約束。米国の「Brain Initiative」では脳内回路の全てを完全にマッピングすることが目標の1つに掲げられている。

(参考) 本件報道記事

The Golden Age of Neuroscience Has Arrived

We have learned more about the thinking brain in the last 10-15 years than in all of human history.

By Michio Kaku

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More than a billion people were amazed this summer when a 29-year-old paraplegic man from Brazil raised his right leg and kicked a soccer ball to ceremonially begin the World Cup. The sight of a paralyzed person whose brain directly controlled a robotic exoskeleton (designed at Duke University) was thrilling.

We are now entering the golden age of neuroscience. We have learned more about the thinking brain in the last 10-15 years than in all of previous human history. A blizzard of the new technologies using advanced physics—resulting in scans and tests we know as fMRI, EEG, PET, DBS, CAT, TCM and TES—have allowed scientists to observe thoughts as they ricochet like a pong ball inside the living brain, and then begin the process of deciphering these thoughts using powerful computers.

The Pentagon, witnessing the human tragedy of the wounded warriors from Iraq and Afghanistan, has invested more than \$150 million in the military's Revolutionary Prosthetics program, so that injured veterans can bypass damaged limbs and spinal cords and mentally control state-of-the-art mechanical arms and legs. Already, the technology exists to let you walk into a room and mentally turn on the lights, control appliances, surf the Web, write and send emails, play videogames, dictate articles, control a distant robot or avatar, and even drive a car.

Not just our bodies, but even our memories are now being digitized. Last year at Wake Forest University and the University of Southern California, scientists for the first time were able to record and upload memories directly into an animal brain, which is something straight out of a sci-fi movie like "The Matrix." Scientists there trained mice to perform certain simple tasks, which can be recorded by sensors placed in their brains. After they forget the task, the digitized memory can be reinserted back into their brain, allowing them to remember.

One short-term research goal is to create a "brain pacemaker" for Alzheimer's patients. By pushing a button, a person might be able to remember where they live and where they are. But one can imagine a day in the future when we might even be able to upload the memory of a vacation that we never had, or the math course that we never passed.

Although the technology is still in its infancy, there may come a day when the Internet might be replaced by a Brain-net, in which emotions, sensations, memories and thoughts are sent over the Internet. Think about it: Instead of using clumsy symbols like :), teenagers would go crazy sending all their adolescent emotions and feelings on a mentalized version of Facebook.

A Brain-net could revolutionize every aspect of our life, including education and entertainment. The movies (basically a flat screen with sound) would be replaced by total-immersion entertainment, where we would experience the totality of sensations experienced mentally by the actors. It might also reduce barriers between people, as we would be able to experience their suffering and life stories.

Scientists at the University of California at Berkeley have already made progress in photographing our thoughts. A subject is placed in an Magnetic Resonance Imaging machine, which scans your brain as you watch a picture or video. A super computer analyzes this mass of MRI data and then reconstructs a reasonable approximation of the original image. One can imagine the day when we might wake up and watch a video of the dream we had the previous night.

Although years of hard work remain to perfect this technology, the stunning pace of progress has caught the attention of politicians. The European Union and President Obama have collectively pledged more than \$1 billion to spearhead this technology. In the U.S. it's called the Brain Initiative, and one objective is to completely map all the circuits of the entire brain.

The short-term goal is to alleviate the suffering caused by mental illness. (According to the National Alliance on Mental Illness, one in four adults will suffer from some form of mental illness in any given year.) But over time the impact of brain-circuit mapping could be as profound as the Human Genome Project, which has revolutionized medicine. In the future, we might have two disks. One disk will contain our genome, containing a genetic blueprint of our body. But the other disk will have our "connectome," storing all the circuits of our brain, conceivably containing our emotions, memories and personality traits.

Even if we die, our genome and connectome will live on. One day we might have a "library of souls," in which we can have a scintillating discussion with our long-dead ancestors or even historical figures. We could talk to a hologram of an ancestor, for instance, which can access all that person's memories and personality.

So the promise of this new revolution in neuroscience is profound, holding out the ability to someday alleviate suffering and enhance our true mental potential. This technology has the power to radically change the medical, scientific, social and even political landscape for the benefit of humanity.

Mr. Kaku is a professor of theoretical physics at the City College of New York and author of "The Future of the Mind: The Scientific Quest to Understand, Enhance, and Empower the Mind" (Doubleday, 2014).

Source :

<http://online.wsj.com/articles/michio-kaku-the-golden-age-of-neuroscience-has-arrived-1408577023?KEYWORDS=golden+age>

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