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HEALTH TECHNOLOGIES

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The near future of technology promises change at an ever-increasing pace while rapidly transforming business models, governments and institutions worldwide. In order to help us make sense of our uncertain future, Policy Horizons Canada engaged Michell Zappa of Envisioning Technology to explore key technologies that are likely to have a profound effect on humanity on a global level and generational timeframe. This report is structured around six key areas of technological research: digital and communications, neuro and cognitive, health, agricultural and natural manufacturing, nano and material science, and finally energy. It provides a sense of how broad and far-reaching our future technologies might be. Digital currencies, hydrogen energy storage, brain-to-brain interfaces, and robotic farms are all likely to be common before 2030. Each of the six key areas indicates the dozen or so interdependent technologies that are most likely to have a high impact on society and the economy. The six images provide the reader with maps of how the technologies portrayed in each area are likely to mature over the next 15 years; that is, our best estimate of the point at which a technology matures so that it can be used.

The visual below looks at health technologies. It identifies three key areas of accelerating change: Augmentation, Treatments and Diagnostics. The first area assists both less abled and fully able people to improve their senses, thought and biological functions. Treatments will improve for different kinds of intervention: from curing genetic diseases, to performing organ replacements and slowing down the aging process. Diagnostics will improve greatly over these next 15 years, enabling doctors and individuals to learn about their medical state in real-time.

TREATMENTS

AUGMENTATION

DIAGNOSTICS

2028

2023

2018

2013

Medical nanobots
A subfield of robotics that studies how to make robots that emulate living biological organisms/functions mechanically or chemically. The main objective of this technology applied to medicine is to enhance the human body's capabilities or treat malfunctions with robots capable of re-programming and adapt to different conditions, always mimicking organic functions.

Enhanced organs
Engineered replacement organs for humans that perform better than their natural counterparts. Examples include artificial red blood cells and super-livers (via genetically engineered organs that overexpress key proteins). Respirocytes, for example, are theoretical artificial red blood cells that carry oxygen 200x more efficiently than red blood cells.

Anti-aging drugs
Breakthroughs in tissue rejuvenation with stem cells, molecular repair, and organ replacement (such as artificial organs) might eventually enable humans to have indefinite lifespans through complete rejuvenation to a youthful condition.

Prenatal gene manipulation
The direct manipulation of an embryo/fetus genome using biotechnology.

Epigenetic therapy
The phenomena whereby genetically identical cells express their genes differently resulting in different phenotypes in, for example, the formation of cancer originating from cancer stem cells.

Machine-augmented cognition
Refers to the effective use of information technology to augment human cognition using intelligence amplifying system of tools. Information retrieved from the brain would then be used to feedback necessary stimulus to accomplish determined brain functions.

Biohacking
A techno-progressive cultural and intellectual movement which advocates for open access to genetic information and defends the potential of truly democratic technological development. Biohacking can also refer to managing one's own biology using a combination of medical, nutritional and electronic techniques. This may include the use of nootropics and/or cybernetic devices for recording biometric data.

Medical tricorder
A hypothetical handheld portable scanning device to be used by consumers to self-diagnose medical conditions within seconds and take basic vital measurements. A common view is that it will be a general-purpose tool similar in functionality to a Swiss Army Knife to take health measurements such as blood pressure and temperature and blood flow in a noninvasive way.

Biologically extended senses
The idea is based on the principle that the brain evolved to handle one construction of reality, yet now can overlay multiple local and remote experiences simultaneously, creating new cognitive perceptions. Biological senses can be enhanced and produced artificially, which adapt and transform to address different kinds of stimuli for specific purposes.

Organ printing
The use of a combination of cells, engineering, material methods, suitable biochemical and physio-chemical factors to improve or replace biological functions. The term is closely associated with applications that repair or replace portions of or whole tissues.

Personalized medicine
A branch of genomics where individual genomes are genotyped and analyzed using bioinformatics tools. These may eventually lead to personalized medicine, where patients can take genotype specific drugs for medical treatments.

Labs on chips
Devices that integrates one or several laboratory functions on a single chip of only millimeters to a few square centimeters in size. LOCs deal with the handling of extremely small fluid volumes down to less than picoliters. They represent safer platforms for chemical, radioactive or biological studies.

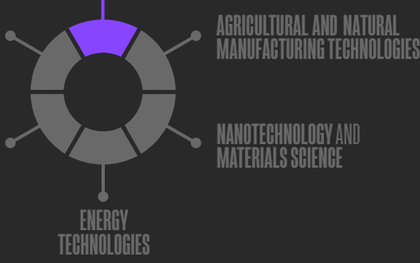
Bionic implants
Microscopic technological structures that extract biometric information from an organism to analyze its performance and improve specific biological functions with assisted feedback. In terms of personal biometry, bionic implants represent great tools to empower preventive medicine and develop customized solutions for specific organisms and diseases.

Biometric sensors
The use of biometrics to telecommunications and telecommunications for remote biometric sensing. Potential applications include monitoring blood levels, infections and efficacy of vaccines.

Best estimate of technology maturation

Possible manifestation range

HEALTH TECHNOLOGIES is one segment from a six-part research project created exclusively for Policy Horizons Canada.



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