

# **HUMAN ENHANCEMENT and Augmentation REPORT - Brain to Brain Communication Even with Other Species . . Bullet Points of Global Strategic War Plans Attached**

Digital anonymity will be difficult if not impossible to maintain - The longevity of data storage means that there is an ever-growing record of people's activity, and attempts to avoid leaving a digital footprint will become increasingly difficult. The growth in the number of surveillance devices is increasing at a rapid rate and, unless individuals go to great lengths to avoid detection, it is likely that by 2045, a near-complete record of their movements could be built up by an interested party. Governments will increasingly exploit extensive databases and surveillance devices to monitor and curtail individuals' activities.

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Future technologies WILL make it possible for people to radically alter their identities by using a range of physical and cognitive enhancements. The power and range of the five major senses will be significantly enhanced, often as a result of extending and applying developments made for medical reasons. Some developments will require surgical implants, implying a degree of permanence – others will probably be temporary. However, it is difficult to speculate on the extent to which enhancing sensory perception will lead to improved interpretation of our surroundings. Some augmentations could provide signals from beyond our normal sensory range. Despite its inherent adaptability, it is not clear how well the human brain will be able to process such data to produce useful information and analysis.

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New technologies will be able to extend our visual sense beyond the range of visible light into other parts of the spectrum. Implants designed to help restore sight provide an early indication of what will be achieved in allowing us to 'see' otherwise non-visible radiation. Our hearing will be significantly enhanced. Hearing aids are currently being developed that can choose and boost frequencies of interest which will enhance the ability to detect and understand speech in noisy environments. Similarly, improved understanding of how the brain can discriminate between individual smells in a mix of odours found in a typical room could provide the basis for developing future technology that will enhance our sense of smell. Even the tongue could be used as a novel pathway to conduct a

range of sensory information to the brain, from external sensors such as cameras or sonar.

Advances in a range of disciplines, such as brain science and pharmacology, will increase our ability to influence emotional responses such as motivation, anxiety and fear – all of these affect individual performance in areas of considerable significance. Cognitive function will be enhanced either by machine interfaces or by using chemicals. Treatments, often developed to address mental health issues, will be widely used by healthy people to augment or optimise cognitive performance, offering potential enhancement of many aspects of cognition, from learning and memory to wakefulness, attention and motivation.

External and internal electro-mechanical devices will enhance human physical performance. For example, powered exoskeletons already in development allow users to lift loads of up to 90kg without their performance being impaired, as well as reducing fatigue experienced when exercising. Prostheses are being developed that exceed the functionality of the limbs they replace and whose electronic control systems outperform the original. Brain- machine interfaces will allow direct control of prostheses, exoskeletons and systems remote from the body. Control of simple devices by thought is already a reality. (Note: Ted Talks)

Some Social and religious groups will not want to adopt to these new augmentations for ethical reasons. Equally, not all who wish to adopt these new technologies will be able to do so – the rich will almost inevitably have better access than the poor. Many of the technologies described above will almost certainly be expensive, leading to the prospect of poorer people being excluded from the benefits that technological enhancements may provide. Such inequality could lead to disaffection and instability when such groups perceive themselves as being marginalized.

## ***Brain Computer Interface (BCI) -***

Direct brain-to-brain communication will likely be achieved by 2045, transforming ways of working. The real-time transfer of behaviourally meaningful information between the brains of two rats has already been demonstrated, with rats successfully performing tasks that they had not previously attempted. Building on the progress that has been made with animals, the ability to move another's hand through non-invasive brain-to-brain interfaces has already been demonstrated. When extended to complex cognitive tasks, the approach of directly linking brains will be the basis for wholly new methods of decision-making, problem solving and planning. BCI methods will involve collaboration and using directly-shared knowledge and experience between humans (and potentially between humans and other species). OTHER SPECIES . . .

As well as potentially transforming both sensing and decision-making, direct brain linkage will have profound implications for social interaction and for the notion of what it means to be an individual human being. As seen with current interaction with virtual environments, where high-use levels sometimes lead to addiction, there would be powerful behavioural effects. Notions of individuality would be challenged, leading to questioning of loyalties and allegiances to organisations, as individual and group identities merge. By 2045, it is even possible that the sharp distinctions between people and machine will disappear. Mind-controlled machinery will become much more sophisticated, with human brain-to-brain communication possible before or by 2045.

## ***Future weapons***

Increased levels of defence spending and continuing advances in technology will lead to a variety of new weapons. For example, laser systems are maturing, with vehicle and sea-based platforms already at advanced stages now. Directed energy weapons, such as lasers, are currently capable of discrete target discrimination, producing a focussed beam (or wider field) of electromagnetic energy or atomic radiation to cause disruptive or damaging effects to equipment and infrastructure. Such weapons will be capable of delivering "non-lethal" effect on human targets at considerable distances. Increases in the number and sophistication of sensors (civil and military) will increase the accuracy of targeting, as well as making it increasingly difficult to hide people, machines or equipment. As people use electronic devices more frequently, the ability to target an individual by their 'digital

signature' will become easier. The cost of sequencing an individual's DNA continues to fall, targeting an individual using their DNA . We will see sophisticated environmental warfare, capable of spreading plant and human diseases by insects or insect-machine hybrids. Crops and cattle will be destroyed, as well as people being incapacitated or killed.

Globalisation, in particular the spread of technology, information and ideas, will give an increasing number of people (both state and non-state actors) access to sophisticated and technologically advanced capabilities. This is likely to increase the opportunity for unconventional attacks on technologically sophisticated nations, including by terrorists.