

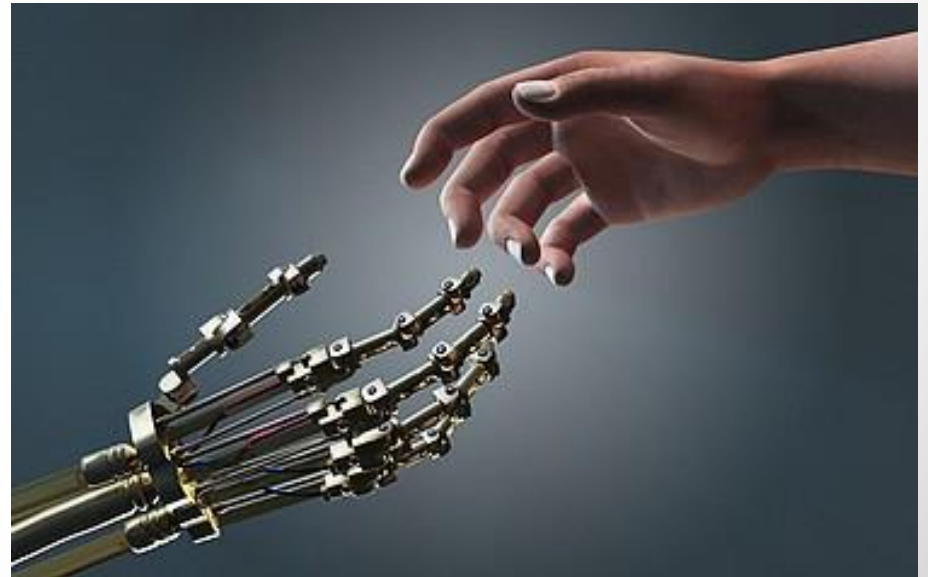
ETHICAL AND SECURITY IMPLICATIONS OF EMERGING TECHNOLOGIES

*Kapuscinski Development Lectures
Cyprus, October 14, 2015*

Professor Nayef Al-Rodhan

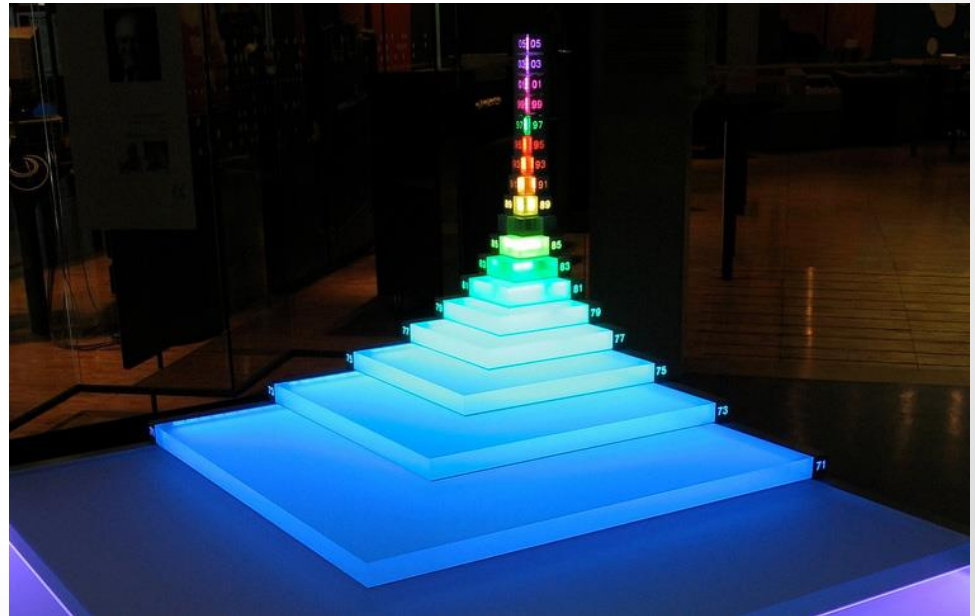
New technology touches every aspect of our lives.

- Health
- Communication
- Security
- Transportation
- Leisure



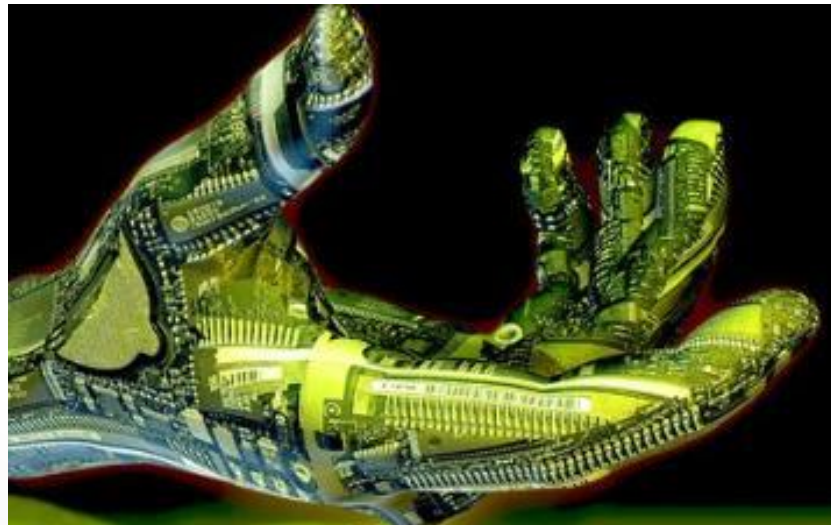
Technology is advancing at breakneck speeds

- Moore's Law turns 50
- Carlson Curve



Emerging Technology

- New technological fields that have a revolutionary impact on different aspects of our lives
- Some are a few decades old, but are now becoming very important



Ethics

- Technology in itself is neither good nor bad
- We cannot ignore potential for misuse
- Tech that can be a boon for humanity can also destroy it



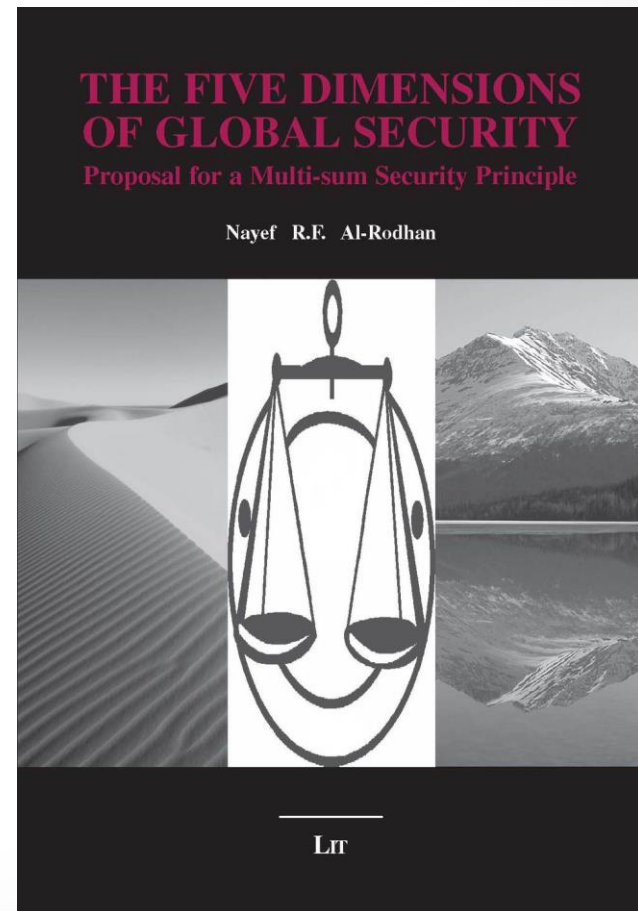
Security

- Technologies influence all aspects of security, not just state security



5 Dimensions of Global Security

- Human Security
- Environmental
- National
- Transnational
- Transcultural



Regulation

- Urgent need:
 - To assess risk
 - Develop mechanisms for oversight
- Regulation must not stifle innovation



Significance

- The future is now-these advances are inevitable
- Humanity needs to be proactive rather than reactive



Significance (cont.)

- If left unregulated, such technology could literally destroy humanity.



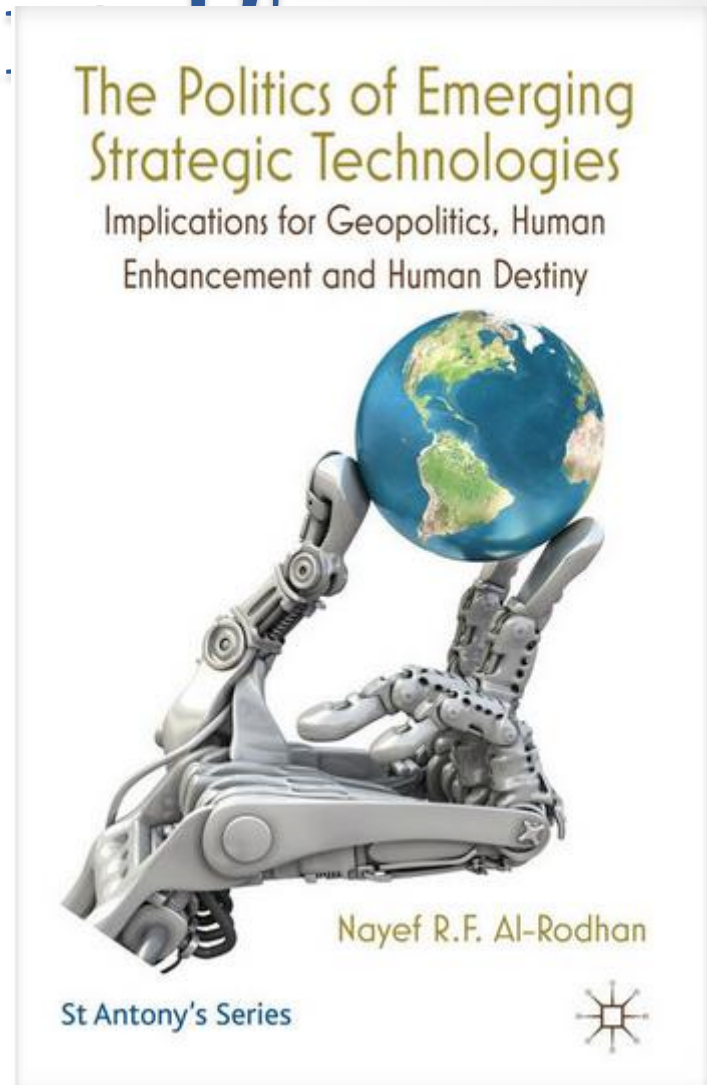
Human Nature

- The most basic characteristics that make us human are what drive us to change what it means to be human



The New DE

- Power
- Pride
- Permanency
- Profit
- Pleasure



Individual Technologies

- Many emerging technologies have an immediate as well as a potential impact on the future of humanity



Synthetic Biology

- The synthesis of complex biologically based or inspired systems which display functions that do not exist in nature.

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Synthetic Biology - What to Expect and Fear?

By Nayef Al-Rodhan



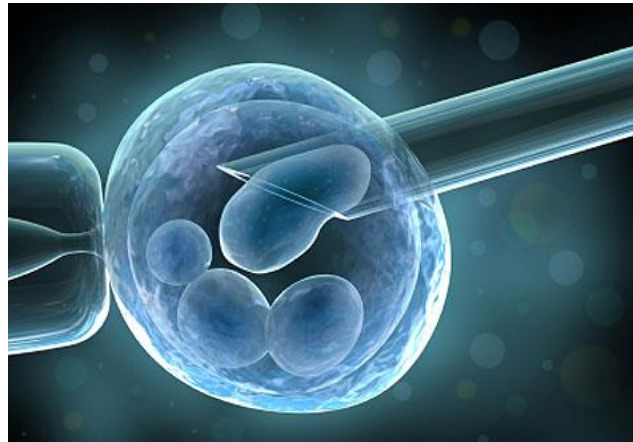
Interactions between life sciences and engineering are now providing solid ground for many futurologists to see their postulation of a "life 2.0" reality become materialized within decades. Life sciences have undergone outstanding transformations in the past five decades and the rapid advances in synthetic biology are pushing new frontiers in the chemistry of life and the manipulation of genetics.

Synthetic biology ("synbio") is the engineering of biology and its aim is to synthesize complex biological systems to perform functions that do

not exist in nature. It includes several engineering strategies (such as genome design and construction, applied protein design, natural product synthesis etc) and its focus is on the design and construction of core components (parts of enzymes, genetic circuits etc) which can be modelled and tuned to meet specific needs or address very specific problems. This is the crucial novelty of synthetic biology, as

Synthetic Biology (cont.)

- Far more involved than GMOs- Synbio introduces new DNA into the world/biosphere
- It will enable rational and systematic design of biological systems



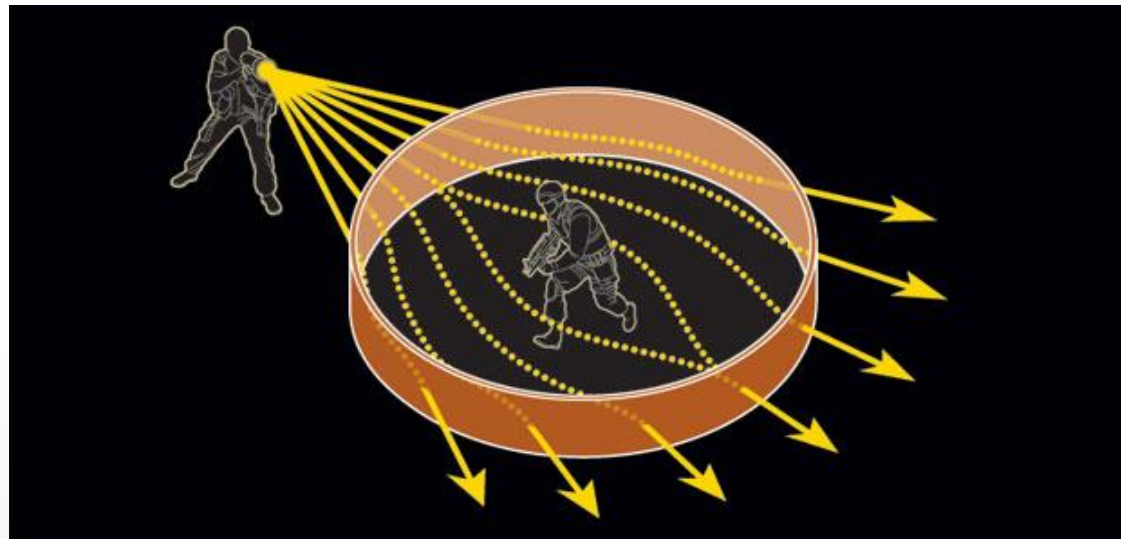
Synthetic Biology (cont.)

- Applications for Synthetic Biology would reduce strain on resources
- Energy- generating Hydrogen
 - Medical – diagnostic applications or destroying cancer cells
 - Chemical industry - bacteria that eat pollution in the water



Invisibility Cloaks

- Developed for military use
- Uses meta-materials to bend electromagnetic waves around an object and create the illusion of looking through the object



Precise Genetic Engineering

- Allows precise and accurate DNA editing to selected target genes



Will Biology Change What it Means to be Human?

By Nayef Al-Rodhan



Image: Human genetic material is sorted at a laboratory in Munich May 23, 2011.

REUTERS/Michael Dolder

The latest scientific advances will soon enable us to take charge of evolution itself. Synthetic biology is a new form of engineering that involves the creation of complex, new biological systems. It is the result of the confluence of knowledge in life sciences, engineering, and bio-informatics, and the most promising innovations in this

new field – genetic design, protein manufacture and natural product synthesis – could have a revolutionary impact on our lives, particularly with regards to the production of energy and medicine. It brings with it gigantic opportunities and risks.

Early innovations may include personalized genome-specific medications for the treatment of

Precise Genetic Engineering (Cont.)

- Increased control over specific mutations
- Huge implications for agriculture and will change the way genetic engineering is perceived



Predictive Analytics

- Increasingly used by the military
- Uses data-mining to predict outcomes



3D Printing

- Is revolutionizing how we manufacture and has implications for biology
 - 3Dprinting of organs or prosthesis
- Multiple uses for military purposes



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Printing the Future?

By Nayef Al-Rodhan

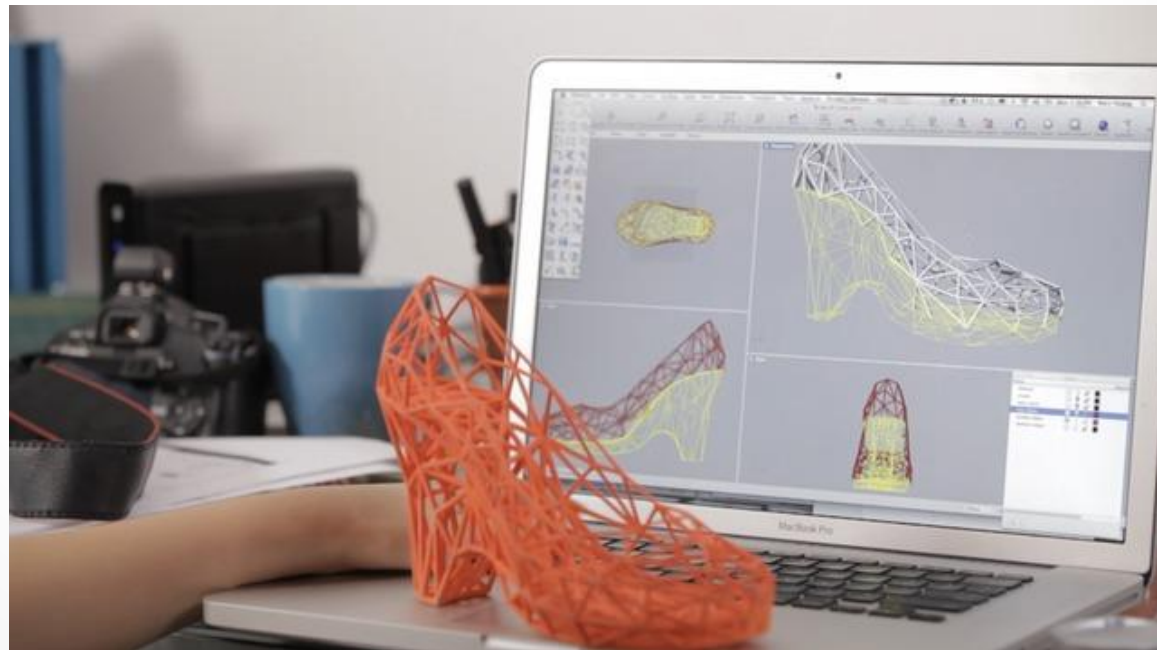


Most technologies featured in the genre of science fiction are far from materialization but, to some extent, we already live in the future it anticipated. Some objects that were incredible, futuristic or fictitious just a decade ago are now accessible in local stores or exist as works-in-progress in laboratories. Laser guns, touch screens, the roomba robot, and genetic engineering are just a few of the objects and techniques that can be duly credited to the 'Sci-Fi' imagination (a full glossary is available here). The functionality of these technologies is extremely broad and their use ranges from entertainment to national defense

(such as the Laser weapons systems, or LaWS, currently being tested by the US Navy). While the invisibility cloak is still under development, Three Dimensional (3D) Printing, long regarded with

3D Printing (cont.)

- Democratization of manufacturing
- Implications for security, copyright law, and traceability



4D Printing

- The 4th dimension is Time
- Additive manufacturing which takes into account transformation over time



Design Within Reach

Preparing for the 4-D Printing Revolution

By Nayef Al-Rodhan



Andreas Kroger looks at a 3D-printed figure of himself in Berlin, December 2012. (Thomas Daniel/Contrasto/24/7mag)

Two years ago, the physicist Neil Gershenfeld argued that the next great digital revolution would come not in computing or communication but in fabrication. Today, 3-D printing, which uses digital data to rapidly construct physical objects, is more accessible than ever. Automakers are placing the latest printing devices on factory floors, design students are learning they can make virtually anything out of plastic and

4D Printing (cont.)

- Smart materials will adapt and repair themselves without maintenance
- Could be invaluable for smart infrastructure and nano-medicine



Artificial Intelligence

- Intelligent computers that can perform calculations faster and more efficiently than humans
- There are limitations

The
FLETCHER FORUM
of World Affairs

On Artificial Intelligence and Meta-Geopolitics

By Nayef Al-Rodhan



When TOPIO 1.0, a bipedal humanoid robot that plays table tennis against a human being, was first displayed in 2007, the news hardly received global acclaim. Artificial intelligence (AI) developments, which refer to intelligent computers and machines (equaling or surpassing human intelligence), have become increasingly widespread and commonplace. AI benefits our daily existence even in the most

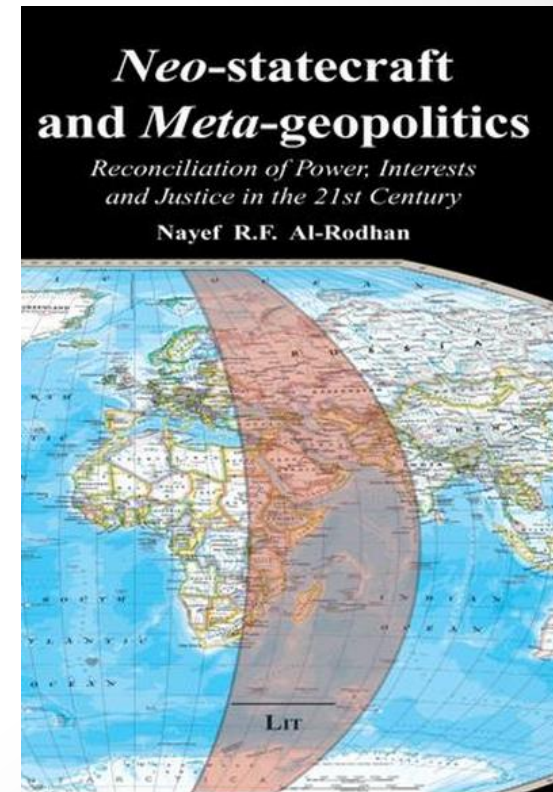
Artificial Intelligence (cont.)

- Involves contributions from different disciplines
- As of yet, there is no machine smarter than a human



Artificial Intelligence (cont.)

- Has implications for all 7 State Capacities
 - Social & Health
 - Domestic Politics
 - Economy
 - Environment
 - Science and Human Potential
 - Military and Security
 - International Diplomacy



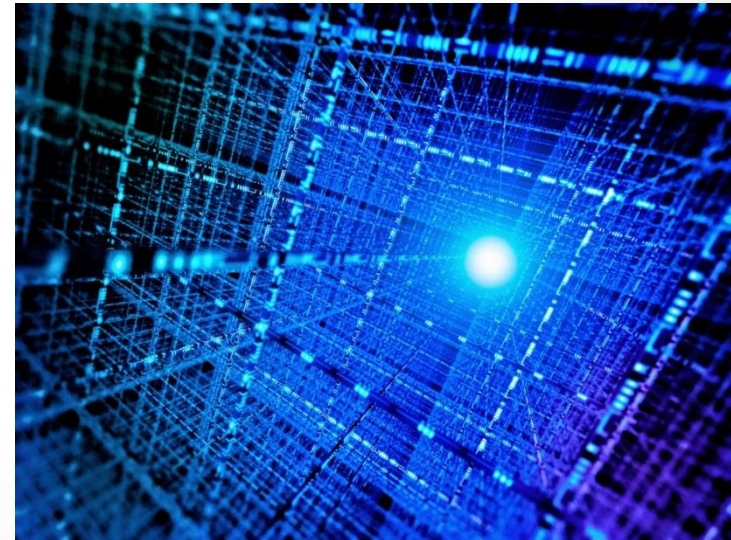
Quantum Computing

- Uses quantum bits (qubits) to calculate through quantum entanglement
- Can calculate every possibility simultaneously
- Can calculate billions of times faster than traditional computers



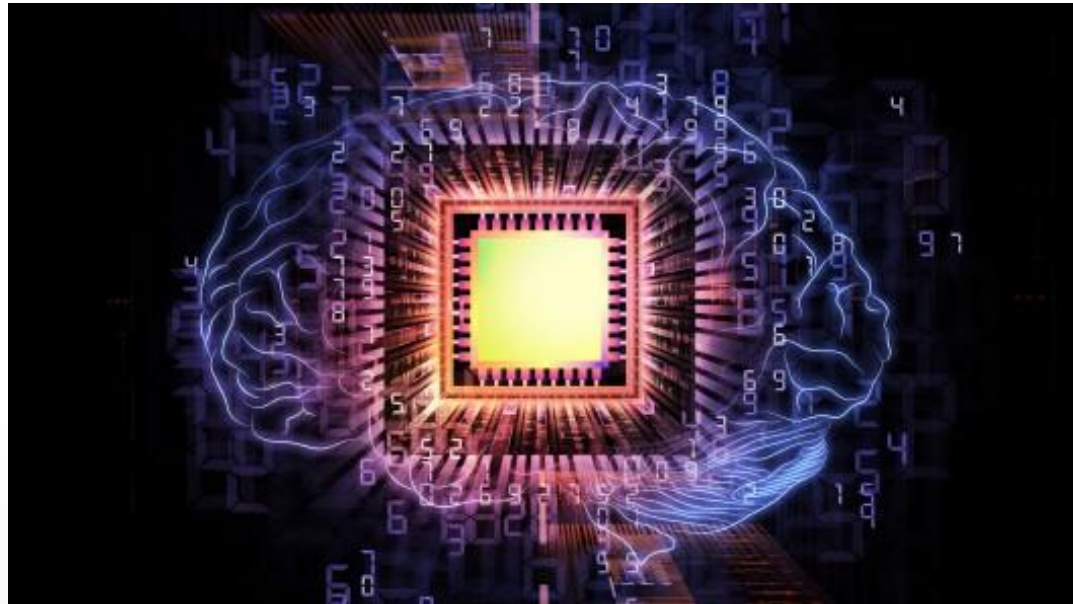
Quantum Computing (cont.)

- Uses and dangers
 - Cures for cancer
 - Finding distant planets
 - Breaking public key encryption
 - Predicting stockmarkets
 - Threat to Privacy
 - Surveillance



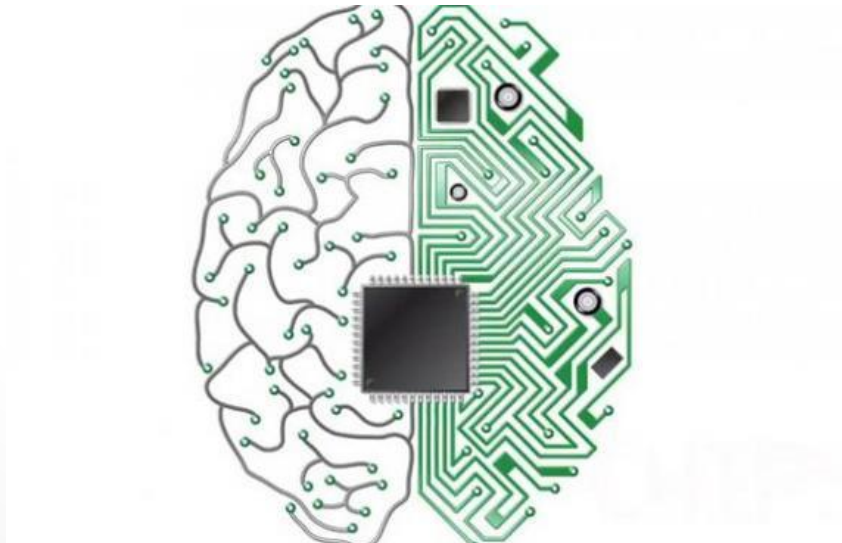
Neuromorphic Chip Technology

- Mimics the intricacies of the human brain
 - processes more slowly, but is very complex
 - Can develop memory and complex analogies



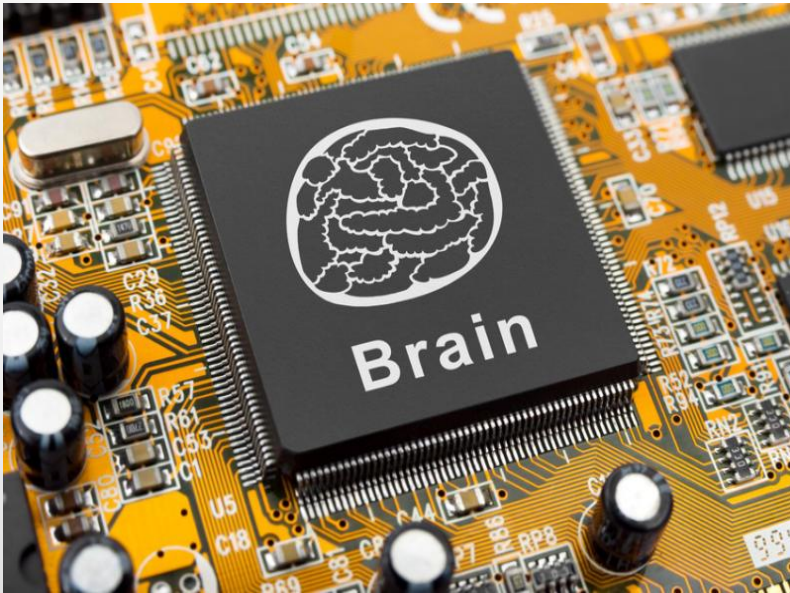
Neuromorphic Chip Tech (cont.)

- Traditional computers are linear in the way that they operate
- Neuromorphic chips process information differently, mimicking the brain's architecture



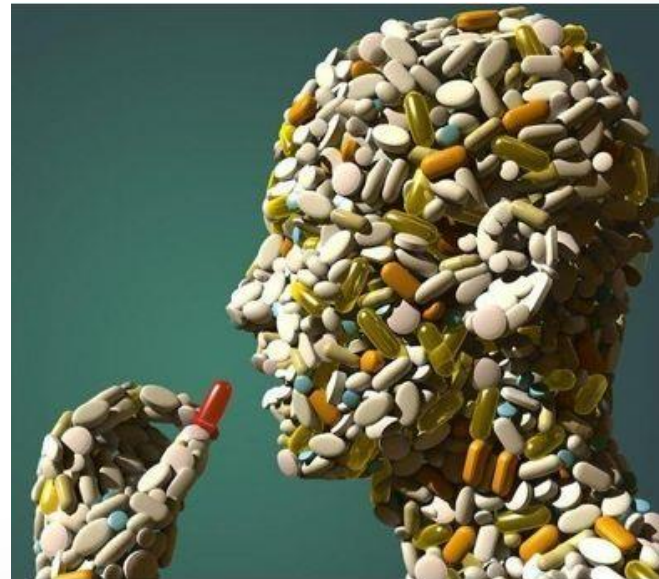
Neuromorphic Chip Tech (cont.)

- Ethical implications of creating machines as smart as humans
- Humans as pets?



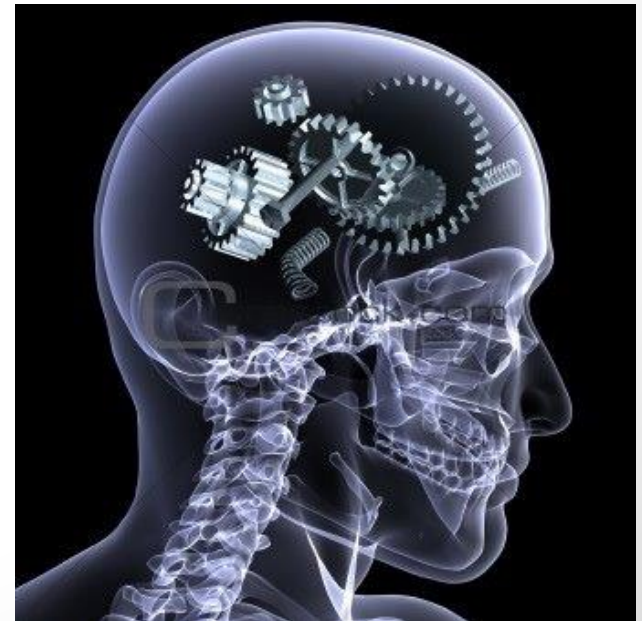
Cognitive Enhancement

- Part of Cognitive Neuroscience
- Internal biological enhancements that amplify or extend the capacities of the human brain beyond a normal, healthy state



CE and Emotionality

- Emotions are physical, cellular, and subcellular neurochemical events
- In the future we will be able to:
 - Enhance our mental dexterity
 - Control our *emotionality*



Transhumanism

- Altering the human body beyond its normal functional range
- Ex. Super human senses or capabilities, techno integration



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Inevitable Transhumanism? How Emerging Strategic Technologies Will Affect the Future of Humanity

By Nayef Al-Rodhan



It is ironic and indeed counterintuitive that our own human nature has a huge potential to drive us towards physical and cognitive enhancements that may completely alter the characteristics of our species. As I have outlined in a previous work, human nature is defined by *emotional amoral egoism*.¹ Humans are genetically and neuro-chemically programmed to 'feel good' and are driven by a number of factors, which I call the "Neuro P5": "*power, profit, pleasure, pride and permanency*".

Transhumanism

- Theory of the human/robot singularity
- Transhumanism political movement



Brain Computer Interfaces

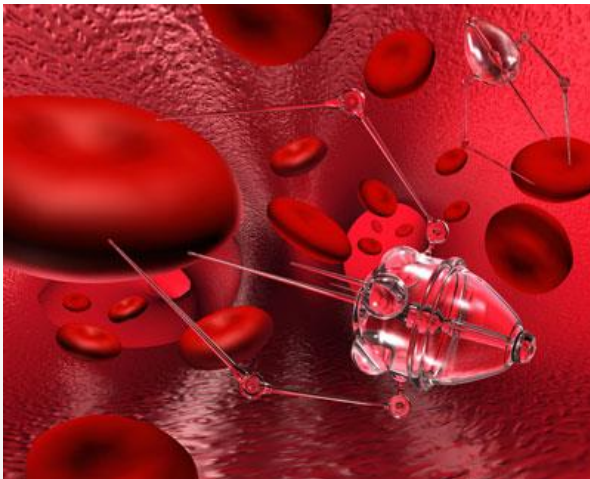
- Possibility of human interaction with computers through thought alone
- Hackers could use this to access sensitive or critical data, hijack systems and manipulate devices



•

Convergence

- Many emerging technologies use components from various numerous technologies
 - Cancer-fighting robots
 - Biological print button
 - Transhumanism



Dual Use

- All these technologies can have military as well as civilian uses
- They offer both potential opportunities and risks
- Important for technologies to not fall into the wrong hands



Risks

- Decreased security
- Contamination of biosphere
- Hacking
- Privacy infringement



Role of Policy and Regulation

- Current regulation more reactive than proactive
- Most of these
- Discourse around autonomous weapons systems



Potential Avenues

- UN Regulation
- Individual
 - Research Ethics and Integrity
- Self-regulation
 - Industry and state- level



Regulations Must:

- Prevent runaway technologies
- Take into account social, cultural, ethnic, religious, and economic aspects



Conclusion

- Urgent Oversight
- Massive exercise of political will
- Good governance



For More Information

- Sustainable History
 - <http://www.sustainablehistory.com/>
- Academia.edu
 - <https://oxford.academia.edu/NayefAIRodhan>

The image shows a screenshot of the Sustainable History website. The header is dark blue with the 'SH' logo on the left and navigation links (Home, Biography, Book Gallery, Books, Articles, Quotes, Interests & Concepts, News & Media, Contact) in the center. On the right of the header are social media icons for Twitter, LinkedIn, Pinterest, Email, Google+, and Facebook. Below the header is a grid of book covers. The central focus is a white content area featuring a portrait of Prof. Nayef Al-Rodhan and a bio: 'SUSTAINABLE HISTORY by Nayef Al-Rodhan. Prof. Nayef Al-Rodhan is a Philosopher, Neuroscientist and Geostrategist. Honorary Fellow: St. Antony's College, Oxford University, UK, and Senior Fellow and Programme Director of the Geopolitics and Global Futures Programme at the Geneva Center for Security Policy, Geneva, Switzerland.' Below the bio are social media icons for Twitter, LinkedIn, Pinterest, Email, Google+, and Facebook. The background of the website is a collage of architectural and scientific images.

THANK YOU!