Defense Advanced Research Projects Agency (DARPA)
Biological Technologies Office (BTO)

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Briefing prepared for Defense Health Board

2 June 2016
What is DARPA?

- SATURN F1 Rocket Engine
- Stealth Fighter
- Speech Recognition
- Microelectromechanical Systems (MEMS)
- Brain-controlled Prosthetic Arm
- ARPANET
- Global Positioning System
- Global Hawk
- Autonomous Vehicle
- Humanoid Robot
The Needs of Warfighter

- Control complex systems for complex missions
- Operate under extraordinary stress and physical requirements
- Quickly learn complex tasks and concepts

Some of the New Challenges and Opportunities in Biology

- Continued emergence of infectious diseases
- Unprecedented access to the brain and nervous system
- Cheap, accessible gene editing tools

BTO Mission Space

- Outpace Infectious Diseases
- Explore Neurotechnology
- Accelerate Synthetic Biology
Technologies for TBI and Neuropsychological Illness

Revolutionizing Prosthetics

- Proof of concept for closed-loop control in brain research
- Demonstrated motor control and sensory feedback in neural prosthetic

Courtesy: Johns Hopkins APL and University of Pittsburgh

Restoring Active Memory (RAM)

- Computational model of neurobiological mechanisms underlying memory in humans
- Portable, secure wireless prototype implantable neural device for memory restoration in humans

Courtesy: University of Pennsylvania

Systems-Based Neurotechnology for Emerging Therapies (SUBNETS)

- Implanted, closed-loop diagnostic and therapeutic system for treating, and possibly even curing, neuropsychological illness
- Advance neuropsychiatry into the realm of therapy driven by quantifiable characteristics of neural state

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Outpace Infectious Diseases

Prometheus

- Chikungunya Challenge lessons learned
- Prognostics for contagiousness

Mobile Analysis Platform (MAP)

- CLIA*-waived lab accuracy at the bedside
- Multi-functional: medical, biothreat
- Operational testing on-going

ADEPT

- Gene-encoded vaccine, prophylaxis, and treatment
- Ebola, chikungunya, and Zika activities

Dialysis-Like Therapeutics (DLT)

- Extracorporeal therapy in far-forward environments
- Prolonged field care is a DoD capability gap
- Multi-functional (dialysis, pathogen removal, immuno-modulation)

* Clinical Laboratory Improvement Amendments

Courtesy: Ibis Biosciences

Courtesy: NxStage Medical, Inc. and Battelle
Restoring Health through Peripheral Interfaces

HAnd Proprioception and Touch Interfaces (HAPTIX)

- Prosthetic hands with natural control and sensation
- Fully-implantable devices, approved for long-term human use
- Demonstrate benefits in 12-month take-home study

Electrical Prescriptions (ElectRx)

- Precise and intelligent modulation of nerve-organ end circuits to improve physical and mental health
- Paradigm shift for medicine: using nerves instead of drugs
- Develop minimally invasive strategies for monitoring and modulating nervous system and health status