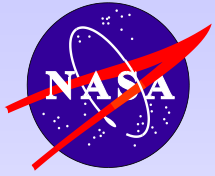


Dennis M. Bushnell
Chief Scientist
NASA Langley Research Center

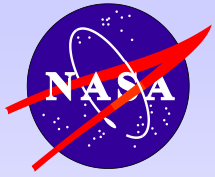
Future Strategic Issues/Future Warfare





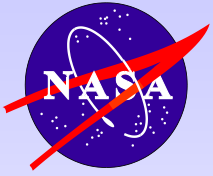
Bio Revolution Applications

- **“Pharm Animals” [drugs, spare parts]**
- **Spider genes in goats allow spider silk spinning from goat milk for “Biosteel”, 3.5X strength of aramid fibers for Armor**
- **Binary Bio-weaponry**



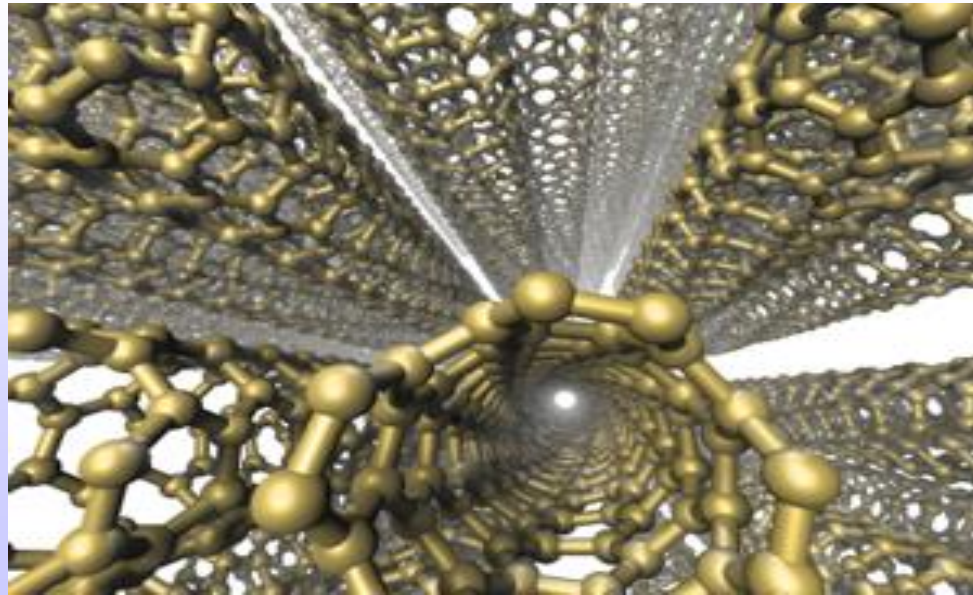
A Real Transgenic Spider Goat

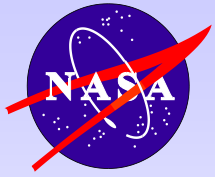




Carbon Nanotubes

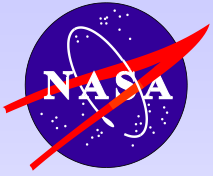
- **100X strength, 1/6 weight of steel**
- **8X better Armor**
- **Low energy Molecular/Petaflop Computing**
- **Ultra Capacitor/High Temperature SC**





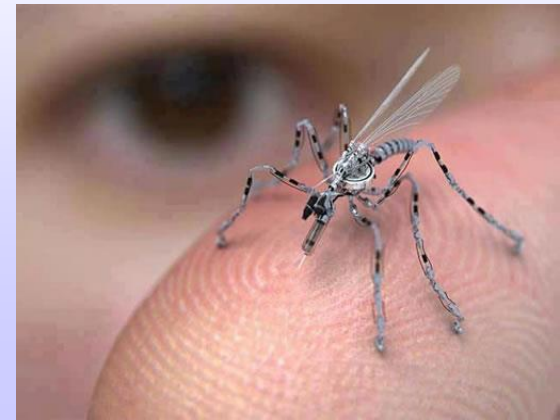
Make the cover of plans lighter & stronger





Some Sensor “Swarms”

- **SMART DUST**
 - Cubic mm or less
 - Combined sensors, comms and power supply
 - Floats in air currents for up to 2 years
- **NANOTAGS**
 - Placed on everything/everywhere
 - Identification and Status Info
- **Co-opted INSECTS**



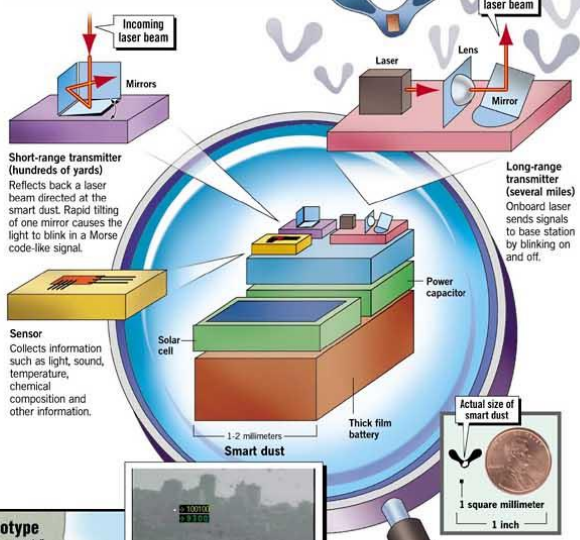


Air Delivery
 Researchers are exploring a number of methods for deploying "smart dust." One technique involves the use of tiny, unmanned aircraft that would spray motes over an area like a miniature crop duster and then relay the resulting information back to a base station.

Winged computers
 Researchers are also exploring ways to prolong the time smart dust remains airborne. By adding "wings" like those on maple seeds, the researchers hope to extend that period two- or three-fold.

Gathering Data on the Fly

Researchers at the University of California are developing tiny, electronic devices called "smart dust" designed to capture information about their environment while literally floating in air. Each dust "mote" packs sensors, computers and wireless communicators onto a tiny silicon chip light enough to remain airborne for hours at a time. As the motes drift, they can monitor their surroundings and beam data back to a base station.



Early Prototype
 Smart dust "macro-mote" made with readily available components.

Sensors: Temperature, light, pressure, humidity

Modified laser pointer

2 inches

3 inches

San Francisco

Twin Peaks

Coit Tower

SF. Bay

9.5 miles

Berkeley Marina

3.2 miles

Oakland

Coy Hall U.C. Berkeley campus

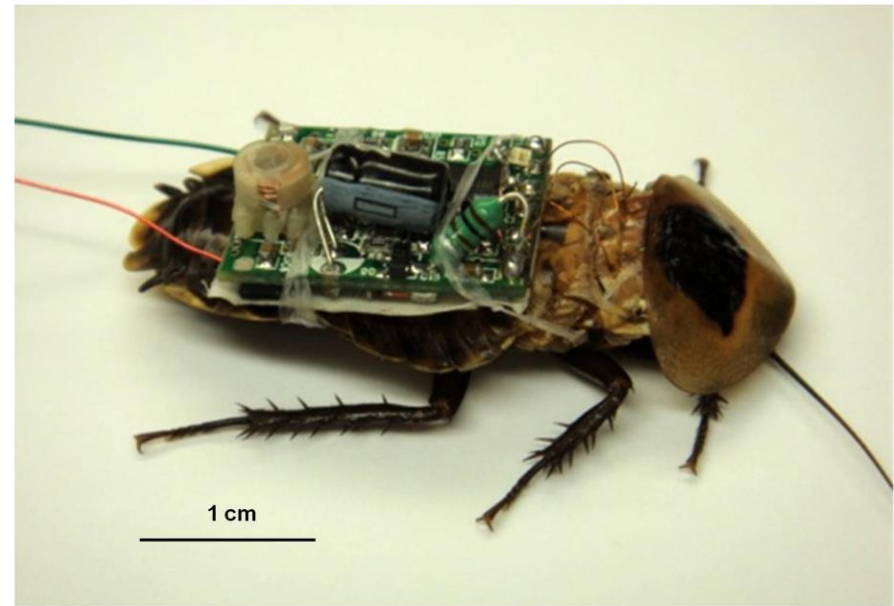
Video image of San Francisco skyline taken with a camera at Berkeley. The white dot is the laser signal emitted by a smart dust device positioned at Coit Tower.

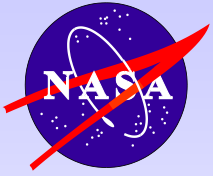
To test their concept, researchers planted golf ball-sized smart dust devices at Twin Peaks and on Coit Tower. Using a modified laser pointer, the device beamed weather information back to Berkeley.

Potential uses

- Military uses include tracking enemy troop movements from above and detecting chemical warfare agents in the air.
- Monitoring weather conditions around the globe and detecting fires and earthquakes are among the nonmilitary uses.
- Stationary motes could be used to monitor the quality of products from factory to consumer.

Source: University of California Department of Electrical Engineering and Computer Sciences.





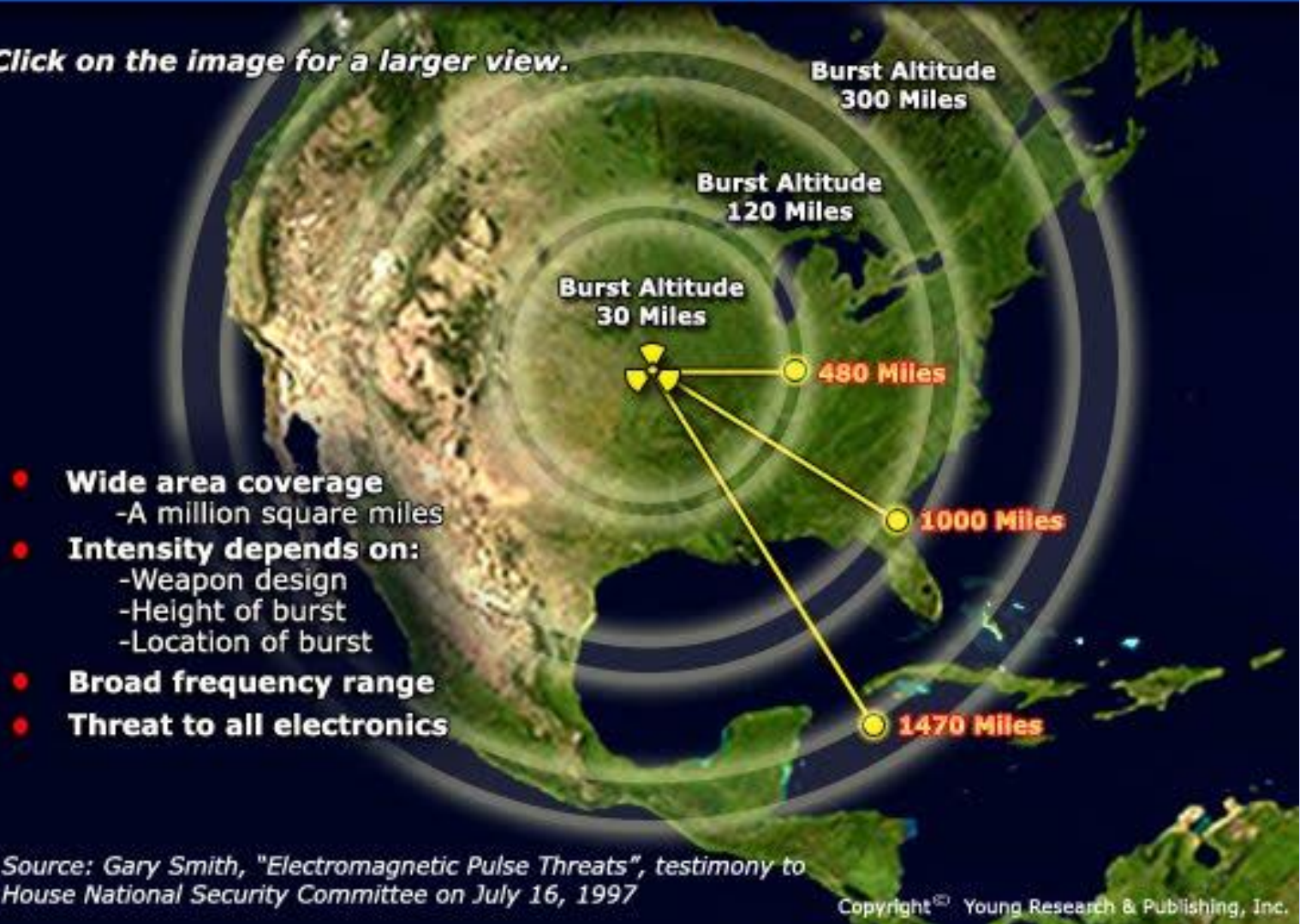
“Volumetric” Weaponry

- **RF**
- **Info/Net/Psy warfare**
- **EMP**
- **Chem/bio Antifunctionals/antifauna**
- **Isomers, Strained Bond Energy Release, etc.**
- **Carbon fibers/Acoustics etc.**
-

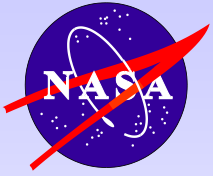


EMP Area By Bursts At 30, 120, & 300 Miles

Click on the image for a larger view.

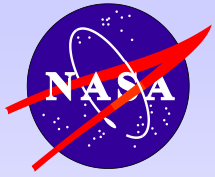


Source: Gary Smith, "Electromagnetic Pulse Threats", testimony to House National Security Committee on July 16, 1997



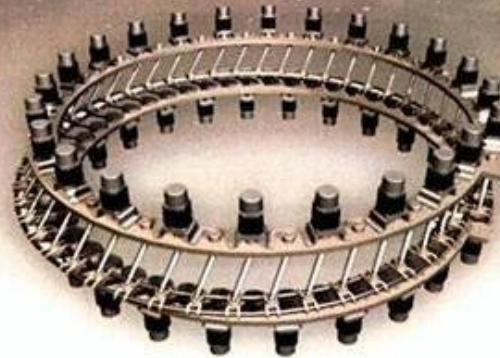
“Slingatron” for Global Precision Strike

- **10Kg projectiles, up to thousands/minute**
- **\$20M/device**
- **Mechanical “on-the-ground” propulsion via Gyrating Spiral Guide Tube (a multiple “hula hoop”**
- **“Poor Mans” Global Precision Strike/“Takedown Weapon”**
- **Originated with Nikoli Tesla’s “Death Ray”**



SLINGATRON

A MECHANICAL **HYPERVELOCITY** MASS ACCELERATOR



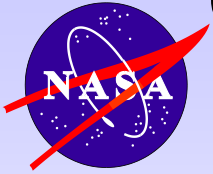
Test Ring



Impact Physics and Space
Launch Research Facility

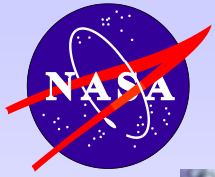


Global Reach Machine



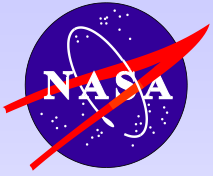
“Orders of Magnitude” Increases in Overall Weapon Effectiveness/Availability at Orders of Magnitude Reduced Cost(s)

- **Bio/Chemical**
- **Molecular/Nano Computing - (E6)**
- **Micro/Nano/Ubiquitous Sensors - (E4)**
- **BioWeaponry - (EN)**
- **Volumetric Weaponry - (E4) thermobaric**
- **Cyber/Artificial Life (Beyond AI) - (E?)**



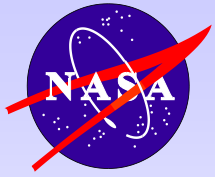
Chemtrails

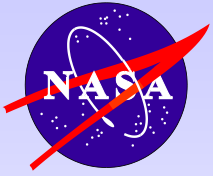




Major U.S. Future Warfare Issues

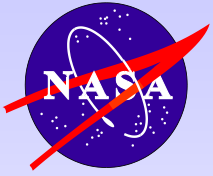
- **“Non-explosive Warfare”** (psywar, biowar IT/net war, “anti-operability war,” Beam weaponry including RF)
- **Robotic Warfare** “in the large”/better than human AI/“Cyber life”





DARPA Laser Weapon

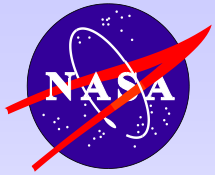




Actual Robotic Soldier



Under the project being undertaken by DRDO, robots would be developed with very high level of intelligence to identify the enemy and be the soldier of the future to replace humans.



Bionic Skin for a Cyborg You

Flexible electronics allow us to cover robots and humans with stretchy sensors

By Takao Someya

Posted 26 Aug 2013 | 17:30 GMT

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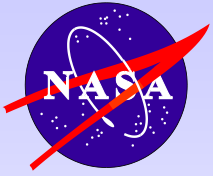
One decade ago, my research group at the University of Tokyo created a flexible electronic mesh and wrapped it around the mechanical bones of a robotic hand. We had dreamed of making an electronic skin, embedded with temperature and pressure sensors, that could be worn by a robot. If a robotic health aide shook hands with a human patient, we thought, this sensor-clad e-skin would be able to measure some of the person's vital signs at the same time.

Today we're still working intensively on e-skin, but our focus is now on applying it directly to the human body. Such a bionic skin could be used to monitor medical conditions or to provide more sensitive and lifelike prosthetics.



Photo: Someya-Sekitani Group

Gilded skin: Takao Someya's latest e-skin material is one tenth the



Gilded skin: Takao Someya's latest e-skin material is one-tenth the thickness of plastic kitchen wrap, and it can conform to any body shape.

Thin-film transistors don't just allow electronics to be flexible—they can also help an e-skin mimic the sensitivity of real skin. Consider this: There are more than 2 million pain receptors in a person's skin, which is equivalent to the number of pixels found in a typical high-definition TV. Synthetic skin covers the circuits that looks like human skin.

