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Related Categories: Military Innovation; Science and Technology; SPACE; Global Health

SOMEWHAT-SUPERMAN SUITS...
Iron Man-style suits may not appear on the battlefield for years to come, but new methods of treating nylon promise to create stronger and lighter protective wear than what is currently deployed by the U.S. military. By treating standard nylon fabrics with carbon nanotubes and sophisticated polymers, researchers at Florida Atlantic University (FAU) are developing armor that has the potential to be 300 percent stronger while maintaining weight equivalent to versions currently in use. According to the project's principal investigator, Hassan Mahfuz, "the whole idea is to absorb the energy and be able to dissipate very quickly so it doesn't concentrate and pierce the fabric and the person inside of it." While the FAU team did not provide concrete research deadlines, it has already received a grant from the Combating Terrorism Technical Support Office of over half a million dollars, indicating that policy planners are paying attention to the obvious potential of the innovation in improving battlefield apparel and armor. (*Defense One*, February 4, 2020)

...AND RADIATION-EATING SPACE SUNSCREEN
One of the major barriers to interplanetary travel, aside from not yet having reliable propulsion, is the problem of exposing humans to vast amounts of space radiation. Now, the answer may have been found in, of all places, the 1986 nuclear disaster at Chernobyl. A special strain of fungi, *Cryptococcus neoformans*, has been found thriving near the radiation laden nuclear disaster site since 1991. The fungus is not novel and is actually dangerous to those with compromised immune systems, and exposure can lead to an infection. Yet, *Cryptococcus* also holds high levels of melanin, which allows it to feed on radiation through a process termed radiosynthesis - similar to how plants convert light into energy via photosynthesis. Melanin is the chemical compound which determines human skin tone. The high levels found in *Cryptococcus* are being analyzed by researchers at the Johns Hopkins Bloomberg School of Public Health, in conjunction with NASA, with an eye toward developing cost-effective sunscreens for astronauts and spacefarers — potentially revolutionizing how humans protect themselves from harmful solar radiation and extending the time that individuals can spend in space. (*CNet*, February 7, 2020)

VIDEO GAMING ADVANCES ROBOT SWARMS
When thinking of a "swarm," one's mind immediately turns to insects. However, modern robot swarms are actually being trained by human behavior. Researchers at the University of Buffalo plan to develop artificial intelligence systems by tracking and collecting biometric data, such as brain activity and eye movement while human subjects play a real-time strategy game created by the Buffalo research team. "We don't want the AI system just to mimic human behavior; we want it to form a deeper understanding of what motivates human actions. That's what will lead to more advanced AI," explains principal investigator Souma Chowdhury. The study is funded by DARPA, and aims to train the AI system to eventually coordinate teams of up to 250 autonomously-operating ground and air drones that can quickly mobilize or reorganize to overwhelm opponents, especially in volatile field conditions which might otherwise be impossible for humans to operate in. (*Interesting Engineering*, February 12, 2020)

HOW AI IS HELPING FIGHT PATHOGENS
Bacteria are becoming increasingly resistant to antibiotics, making it significantly harder to treat infections while stoking fears of future global pandemics. Furthermore, deaths from untreatable or undetected bacterial infections are rising, and scientists say that - if a solution is not found - annual deaths attributable to antibiotic-resistant infections could grow to as high as 10 million globally by 2050. A team of researchers from the Massachusetts Institute of Technology, however, is hoping to change that outlook. In research findings published in the scientific journal *Cell*, the team details that it has found the new antibiotic Halicin can effectively kill 35 diverse strains of bacteria.

For its part, Halicin is the product of a deep-learning algorithm developed by computer scientist Regina Barzilay. To develop Halicin, the algorithm first scanned over 2,500 molecules, such as pre-existing antibiotics, to gauge their effectiveness against known pathogens. Then the algorithm analyzed approximately 100 million molecules to evaluate their effectiveness to combat each pathogen, in particular searching for those whose molecular compositions are sufficiently different than known antibiotics, so as to reduce chances for bacterial resistance. The Halicin finding is particularly germane to the military, because it could potentially be used to combat the bacteria *Acinetobacter baumannii*, which can enter wounds and cause a previously untreatable - and fatal - infection. (*Financial Times*, February 20, 2020)
