

EVERYDAY TECHNOLOGIES FROM FUNDAMENTAL RESEARCH

Federal funding for fundamental research has led to humankind's most groundbreaking discoveries, from the Internet to DNA fingerprinting. Fundamental research touches our lives in a myriad of ways. Here are some ubiquitous technologies - thanks to decades of fundamental research - that make our everyday lives better.

LASER:

Building off work funded by the **Air Force Office of Scientific Research (AFOSR)**, researchers at **Columbia University** drew from Albert Einstein and Wolfgang Paul to create the "maser," laying the groundwork for the laser itself in 1960.¹ Since its inception, the laser has been the basis for a long list of modern technologies, from the DVD player² to life-saving medical treatments.³



GLOBAL POSITIONING SYSTEM (GPS):

After Sputnik's launch, researchers at the **Massachusetts Institute of Technology (MIT)** and **Johns Hopkins University** determined the satellite's exact location through the Doppler effect.⁴ With this observation, and the creation of atomic clocks at the **National Institute of Standards and Technology (NIST)**,⁵ the **Department of Defense (DOD)** and Johns Hopkins University developed Transit, the first global satellite navigation system and precursor to the modern GPS.⁶

BABY FORMULA:

While prepping for a Mars mission, research funded by the **National Aeronautics and Space Administration (NASA)** uncovered algae rich in omega-3 fatty acid, a nutrient in breast milk that helps brain function. That ingredient has since been added to more than 90% of infant formula brands on the market as an enriched supplement.⁷



LITHIUM-ION BATTERY:

Based on fundamental research in the 1950s in lithium chemistry,⁸ and supported by advances in the **Department of Energy's (DOE) Office of Basic Energy Sciences (BES)**, lithium-ion batteries now power everyday machinery and act as a viable solution to grid-scale energy storage.⁹

MAGNETIC RESONANCE IMAGING (MRI):

Researchers at **Stanford University** and **Harvard University** laid the groundwork for the MRI in 1946 when they discovered the phenomenon of nuclear magnetic resonance. Through the 1990s, the **National Science Foundation (NSF)** and the **National Institutes of Health (NIH)** committed substantial funding to ensure the MRI could be developed into the widely used diagnostic tool it is today.¹⁰



TOUCH SCREEN:

Originally used for air traffic control, the first touch screen was invented in the 1960s with indium tin oxide - a compound crucial to electric conductivity.¹¹ Today's touch screen emerged years later from a **National Science Foundation (NSF)**-funded project at the **University of Delaware**, when researchers searched for a no-pressure keyboard.¹²



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RESOURCES

1. http://www.au.af.mil/au/awc/awcgate/ndu/spawned_by_basic_research.pdf
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6. <https://www.darpa.mil/about-us/timeline/transit-satellite>
7. https://spinoff.nasa.gov/Spinoff2008/ch_8.html
8. <https://physicstoday.scitation.org/doi/pdf/10.1063/PT.3.3296>
9. https://science.energy.gov/~media/bes/pdf/BESat40/BES_at_40.pdf
10. <https://www.nsf.gov/about/history/nifty50/mri.jsp>
11. <https://arstechnica.com/gadgets/2013/04/from-touch-displays-to-the-surface-a-brief-history-of-touchscreen-technology/>
12. <http://www1.udel.edu/udaily/2014/may/nai-fellows-052714.html>