

# 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.<sup>1</sup> Since its inception, the laser has been the basis for a long list of modern technologies, from the DVD player<sup>2</sup> to life-saving medical treatments.<sup>3</sup>



## 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.<sup>4</sup> With this observation, and the creation of atomic clocks at the **National Institute of Standards and Technology (NIST)**,<sup>5</sup> the **Department of Defense (DOD)** and Johns Hopkins University developed Transit, the first global satellite navigation system and precursor to the modern GPS.<sup>6</sup>

## 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.<sup>7</sup>



## LITHIUM-ION BATTERY:

Based on fundamental research in the 1950s in lithium chemistry,<sup>8</sup> 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.<sup>9</sup>



## 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.<sup>10</sup>



## 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.<sup>11</sup> 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.<sup>12</sup>



Learn more about America's investment in fundamental research at our website:  
[www.sciencecoalition.org](http://www.sciencecoalition.org)

### RESOURCES

1. [http://www.au.af.mil/au/awc/awcgate/ndu/spawned\\_by\\_basic\\_research.pdf](http://www.au.af.mil/au/awc/awcgate/ndu/spawned_by_basic_research.pdf)
2. [http://www.innovationtaskforce.org/NewSite/wp-content/uploads/2012/08/scientific\\_research\\_2012.pdf](http://www.innovationtaskforce.org/NewSite/wp-content/uploads/2012/08/scientific_research_2012.pdf)
3. <http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/townes-charles.pdf>
4. <https://www.nap.edu/read/9479/chapter/4>
5. <https://www.nist.gov/pml/time-and-frequency-division/time-services/brief-history-atomic-clocks-nist>
6. <https://www.darpa.mil/about-us/timeline/transit-satellite>
7. [https://spinoff.nasa.gov/Spinoff2008/ch\\_8.html](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](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>