

**ASU** Biodesign  
Institute  
Arizona State University

**20**  
YEARS of  
nature-inspired  
solutions  
2004 - 2024

# Celebrating

20 years of nature-inspired solutions

in human health,  
community safety  
and global sustainability

[biodesign.asu.edu](http://biodesign.asu.edu)



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In 2004, the **Biodesign Institute at Arizona State University** opened as a place where scientists collaborate across disciplines using inspiration from nature's ingenuity to pioneer cutting-edge solutions.

These innovations have a **profound and positive impact** on people's lives, transform our understanding of the natural world and drive tangible improvements in society.

**By leveraging our expertise in biomedicine, technology and engineering, the Biodesign Institute is ready for what comes next.**

“ We scientists and researchers have a privileged position in society — the opportunity to stand at the edge of knowledge and look forward to the future. **The greatest reward comes when we can use that knowledge to improve the state of humanity.**”

— **Joshua L. LaBaer, MD, PhD**  
Executive Director, Biodesign Institute



### Biodesign opens

ASU President Michael M. Crow's vision for rapid research success takes shape with the opening of Biodesign Institute Building A. The new institute provides a collaborative, interdisciplinary environment for researchers to explore natural biological systems for the benefit of human and environmental health.



### Rapid expansion

Biodesign Institute Building B opens, demonstrating the rapid pace with which ASU acts on its goal of developing a world-class research program. The event pays tribute to the foresight of the 2003 Arizona Legislature, which passed an appropriations bill that funded this phase of the institute's development.



### Obesity and the microbiome

Gut microbes play a role in regulating weight, according to research from ASU and Mayo Clinic. Modifying these bacteria could one day be a treatment option for obesity.



### Microorganisms and clean water

Naturally occurring microorganisms remove contaminants from water through an ASU developed membrane biofilm reactor. The system provides the microorganisms with hydrogen gas, which must be present for them to change the chemical composition of a contaminant and render it harmless.



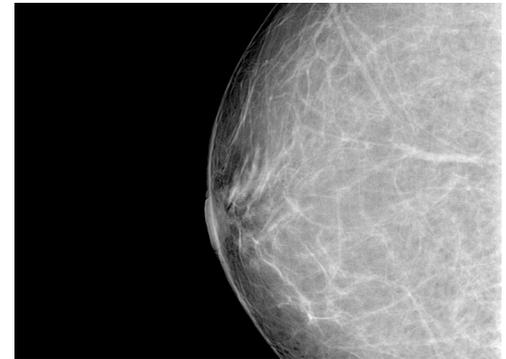
### West Nile therapeutic

Scientists demonstrate the first plant-derived treatment to successfully combat West Nile virus after exposure and infection. Plants offer an inexpensive and effective "laboratory" for creating new treatments.



### Early detection of breast cancer

Researchers discover powerful biomarkers for the early detection of breast cancer. The findings represent the first demonstration of a custom protein-array technology used to find biomarkers in breast cancer patients before clinical diagnosis.



## Mobile health

Breezing, a spinout company, launches the world's first portable metabolism tracker. The device provides users with personalized metabolic information to help them adjust their diet and exercise regimens for maintaining or reaching a healthy weight.



## Synthetic biology

Scientists reveal alternatives to DNA and RNA that are capable of sharing genetic information. The findings offer clues to early life, contribute to the search for life elsewhere in the universe and point to possible applications in molecular medicine.



## FDA approves autism treatment study

The FDA approves a pilot treatment study of 20 children with autism, ages 7–17, with moderate to severe gastrointestinal problems. Through a process known as “fecal microbiota transplants,” researchers see an 80% reduction in gastrointestinal distress and a significant improvement in behavior.



## ASU and Ebola

Two U.S. aid workers infected with Ebola virus recover after receiving an experimental treatment made using modified tobacco plants. ASU researchers developed the treatment, ZMapp, in collaboration with Mapp Biopharmaceutical and Kentucky BioProcessing.



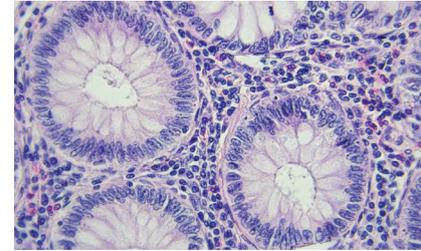
## DNA reader

A prototype DNA reader, developed with scientists from IBM Thomas J. Watson Research Center, could make whole-genome profiling an everyday practice in medicine by significantly reducing the cost.



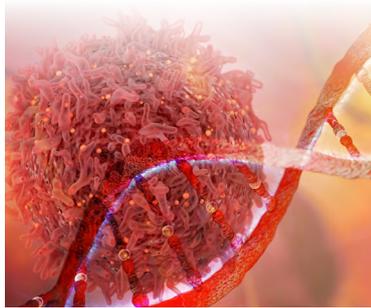
## Colon cancer links

New research details how inflammation triggers colon cancer cells to spread to other organs. The findings will enable researchers to identify new drug targets for the prevention and treatment of colon cancer.



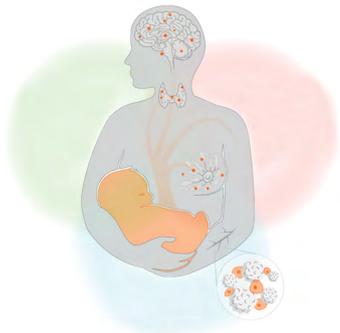
### Cancer's evolution

A new study describes compulsive evolution and dramatic genetic diversity in cells belonging to acute myeloid leukemia. The results significantly alter existing assumptions of cancer progression, indicating much greater genetic diversity in AML than previously assumed.



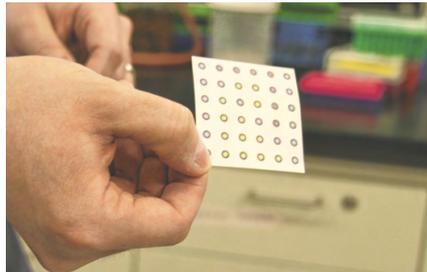
### Fetal influence on mom

Dramatic research shows that during pregnancy, cells of the fetus often migrate through the placenta, taking up residence in many areas of the mother's body, potentially benefiting or undermining maternal health.



### Zika test recognized

Popular Science names a low-cost Zika virus test — developed by researchers from Harvard University and ASU — a 2016 Best of What's New award winner in the health category. The test uses a small strip of paper imprinted with a testing array that holds potential for diagnosing a broad range of infectious diseases, including Zika.



### FDA victory

The FDA announces a ban on the sale of personal care products containing the antimicrobials triclosan and triclocarban. The agency uses findings from an ASU scientist and other researchers showing that long-term exposure to antibacterial products could pose health risks, such as bacterial resistance or hormonal effects.



### Brain power

Researchers investigate the role of mitochondria — the energy centers of cells — in the progression of Alzheimer's disease. The study builds on earlier work suggesting gene mutations affecting mitochondrial function may be critical in the development and progression of the disease.



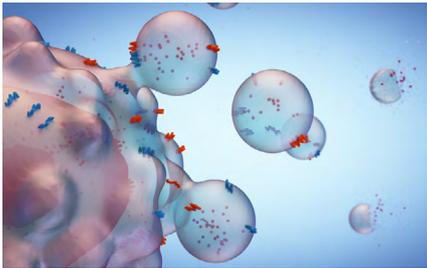
## Improved Zika vaccine

An ASU-led team develops the world's first plant-based Zika vaccine, which could be more potent, safer and cheaper to produce than any other efforts to date. The successful proof-of-concept offers hope for a first-phase human clinical trial.



## Test for pancreatic cancer

A new technique identifies pancreatic cancer early in its development. The method relies on the sensitive detection of extracellular vesicles — tiny bubbles of material emitted from most living cells.



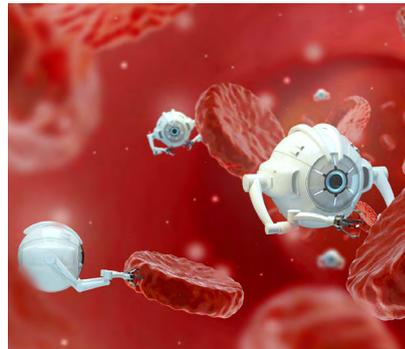
## Rittmann wins Stockholm Water Prize

Biodesign researcher Bruce Rittmann receives the 2018 Stockholm Water Prize for microbiology research and innovations that have revolutionized water and wastewater treatment. The award is sometimes referred to as “the Nobel Prize of water.”



## Nanorobots seek and destroy tumors

Nanobots are programmed to successfully shrink tumors by cutting off their blood supply. The successful demonstration of the technology is the first study of its kind in mammals.



## Alzheimer's viral connection

Multiple lines of evidence suggest that certain species of herpes viruses contribute to the development of Alzheimer's disease. The study, performed with colleagues at Mount Sinai, clarifies the mechanisms by which infectious agents may play important roles in the disease.



## Biodesign Building C opens

The five-story, 191,000-square-foot building gives scientists more space to realize discovery and innovation goals. Biodesign Building C is the third of four facilities planned to accommodate the institute's research efforts.



## Canine cancer trials begin

In the largest canine research trial in history, a Biodesign team begins testing an anticancer vaccine. If the vaccine works in dogs, the researchers plan to test the vaccine in people.



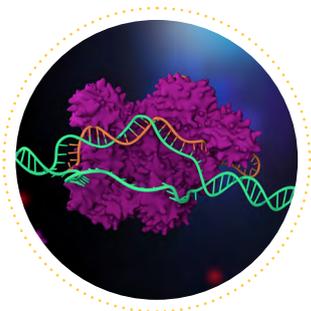
## Plant-based HPV vaccine

ASU researchers shed light on an affordable, plant-based vaccine that stimulates a protective immune response against the HPV virus.



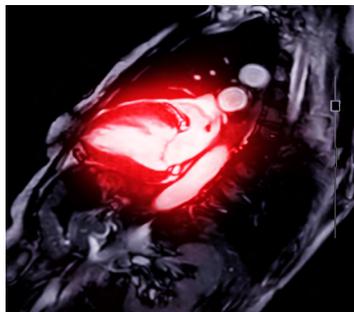
## Safer snipping

Biodesign researchers develop an "immunosilencing" technique that can make CRISPR-Cas9 gene editing safer and more reliable.



## Insights into heart disease

An ASU team captures a high-resolution structure that offers novel insights on an important drug target for improved treatment of cardiac disease.



## COVID-19 saliva test

Biodesign scientists develop the state's first saliva-based test, which is the first in the United States to be made widely available to the public. The new test makes COVID-19 diagnostic testing easier and more readily available to Arizonans.



## Epigenetic insights into dementia

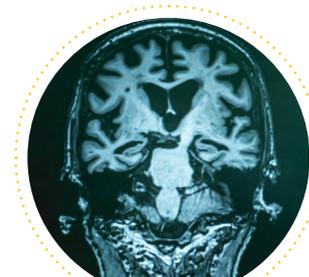
The largest study of its kind unveils new insights into how genes are regulated in Alzheimer's, including discovering 84 new genes linked to the disease. ASU researchers joined international colleagues on this meta analysis.

## Clean water for spaceflight

A first-of-its-kind study characterizes different bacterial populations isolated over many years from potable (drinking) water from the International Space Station.

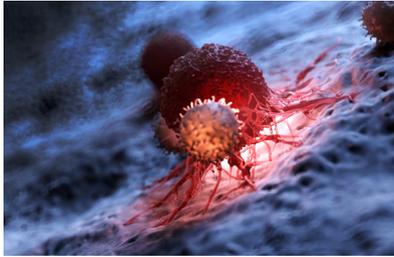
## 1 million COVID tests

ASU invents and develops enough COVID-19 tests to administer one to 1 in 7 Arizonans statewide.



## Viruses vs. cancer

A combination therapy of cancer-fighting viruses in tandem with immunotherapy shows promise in the fight against intractable cancers. The approach uses immune T cells equipped with the myxoma virus to target and kill cancer cells as well as stimulate the immune system to fight the disease.



## Roots of neurodegenerative disease

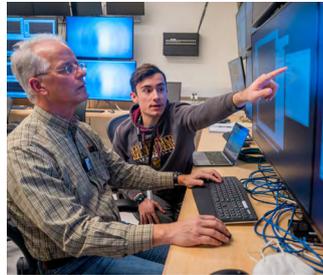
Research unveils common and unique hallmarks of six neurodegenerative diseases: amyotrophic lateral sclerosis (Lou Gehrig's disease), Alzheimer's disease, Friedreich's ataxia, frontotemporal dementia, Huntington's disease and Parkinson's disease — opening the door to new approaches for therapy.



Brochure Folding Diagram

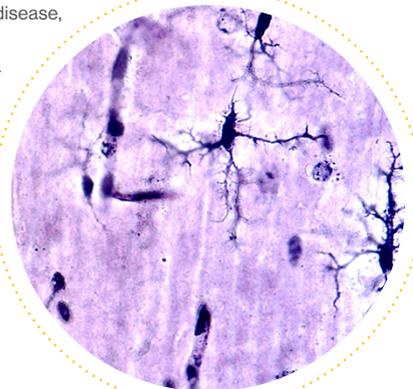
## First light

Scientists generate the first X-rays in the compact X-ray light source — a major milestone for the first-of-its-kind instrument.



## Choline for the brain

Choline shows promise in the fight against Alzheimer's disease, according to a new Biodesign-led study. Deficiencies in the common nutrient are associated with cognitive and motor deficits.



## X-ray boon

The National Science Foundation awards \$90.8 million in funding to Arizona State University — the largest NSF research award in the university's history — to bring about a new era in X-ray science. The funding supports the creation of a first-of-its-kind compact X-ray free electron laser to propel advances in new medicines, renewable energy, quantum technologies, and semiconductor research and manufacturing.



## 20<sup>th</sup> anniversary

As the Biodesign Institute marks its two-decade milestone of groundbreaking research and discoveries, we stand ready to harness our profound expertise to shape a future of enduring impact on health care, sustainability and security.



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