Joseph E. Kerschner, MD

Elevating Science at the Medical College of Wisconsin

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Several years ago, a blog on the relationship between art and science posted by EBSCO Information Services (a company that provides information resources and tools to libraries, including art and science databases) noted that, "Traditionally, art and science have been treated as two separate disciplines, but when they are studied together, it's clear to see the impact one has on the other. Visual art has been used to document the natural world for thousands of years, from cave drawings of animals that help today's researchers figure out yesterday's fauna, to paintings of centuries-old experiments that show us how they were conducted."[1]

Among the most famous examples of the interconnection between art and science is the work of Renaissance master, Leonardo da Vinci. Although da Vinci is best known for his dramatic and expressive artwork, he also conducted dozens of carefully thought-out experiments and created futuristic inventions that were groundbreaking for the time. The Boston Museum of Science, which has exhibited da Vinci's scientific drawings over the years, has created a website that includes an outstanding overview of da Vinci as the artist, the inventor, and the scientist "who has served as a role model applying the scientific method to every aspect of life, including art and music."[2]

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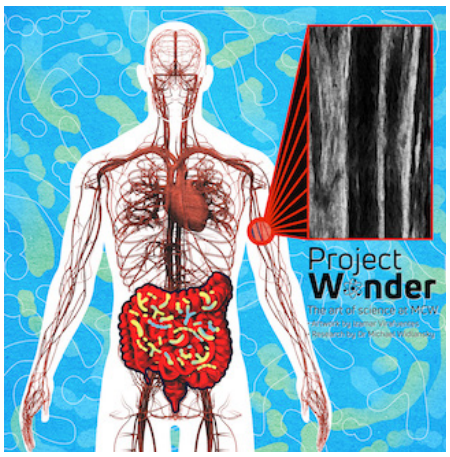
Another example is the drawings of Andreas Vesalius (1514–1564), whose groundbreaking drawings, De humani corporis fabrica (On the Structure of the Human Body), rapidly and fundamentally changed the understanding of human health and disease.[3] Several of these drawings have adorned the halls of the Medical College of Wisconsin's anatomy laboratories for decades.

Art can serve as a bridge to science and is crucial in helping us understand our scientific legacy and how science is well-served by applying an artistic lens. Together, art and science help us interpret, study, and explore the world around us.

To that end, within the walls of the Medical College of Wisconsin (MCW) are individuals dedicated to generating the knowledge that changes lives across our community, state, and around the world. Basic and translational scientists at MCW drive discovery and relentlessly pursue innovative and cutting-edge treatments to positively impact health. The work is challenging, rewarding, and groundbreaking.

To elevate the important work of these health and science leaders, MCW has launched several initiatives designed to create awareness of its research enterprise and elevate the unique contributions of its scientists to advance health globally. One such terrific endeavor is Project Wonder: The Art of Science at the Medical College of Wisconsin.[4]

Project Wonder, launched in March 2022, partners MCW's basic and translational scientists with in-house and community-based graphic designers, artists, illustrators, and writers to elevate and amplify their research interests and discoveries through bold, imaginative, one-of-a-kind artistic representations of innovative, life-changing research and its impact.



Images from Project Wonder: The Art of Science at the Medical College of Wisconsin

Promoted across Instagram, Facebook, Twitter, and LinkedIn, Project Wonder uses

social media to raise awareness of science by making it accessible and engaging for the public. Project Wonder reaches more than 1.5 million people across the globe. To date, the Project Wonder website showcases 11 evocative art pieces with accompanying stories, with more being added on a regular basis.

One piece, titled *Effect of Probiotic Supplementation on Endothelial Function*, seeks to answer the question, "Can bacteria in the gut predict the severity of a potential heart attack?" The piece is illustrated by an animated drawing of the body's circulatory system and gut, accompanied by a beating heart flashing on and off.[5]

According to Michael Widlansky, MD, MPH, Northwestern Mutual Professor of Cardiology and professor of medicine and pharmacology and toxicology at MCW, gut bacteria may even be able to help improve diagnosis and treatment of heart disease. John Baker, PhD, MCW professor of surgery (pediatrics) and pharmacology and toxicology, and Nita Salzman, MD, PhD, MCW professor of pediatrics and microbiology and immunology, director of the Medical Scientist Training Program, and director of the Center for Microbiome Research, demonstrated a link between bacteria living in the gut and heart disease by treating rodents predisposed to heart disease with antibiotics.

The treatment reduced the size of heart attacks and the level of the hormone leptin in the bloodstream, which appears to play a messenger role connecting gut bacteria behavior to heart health. Drs Baker and Salzman found that treating the same rodents with a probiotic containing *Lactobacillus plantarum* 299v—a bacteria known to reduce leptin levels—generated a very similar result. In humans, studies have shown that gut bacteria play a role in controlling systemic inflammation in which the body's immune system is more active than it should be – increasing the risk of heart disease and other conditions.

Based on these and other findings, Dr Widlansky is running a clinical trial testing the antiinflammatory properties of a *Lactobacillus plantarum* 299v probiotic in heart disease patients. His team will measure the effect of the treatment on reducing markers of inflammation in blood samples and increasing blood vessel dilation as a signal of improved vessel health. Dr Widlansky published findings from a pilot study of this probiotic treatment protocol in 2018 that found reduced inflammatory biomarkers in blood plasma and improved blood vessel function in 20 individuals. The clinical trial will expand upon these results significantly with a goal of recruiting more than 200 participants.

A second piece, titled *Watching the Brain Think*, seeks to answer the question, "Is it possible to watch a brain think?" The piece features a creatively illustrated photograph from 1992 that shows the most powerful magnet in Wisconsin (at that time) being lowered by a crane into the formerly named National Biomedical Electron Spin Resonance Center at MCW, accompanied by a soundtrack reminiscent of a spinning magnet.[6]

In the 1990s, MCW became internationally recognized for its pioneering work on functional magnetic resonance imaging (fMRI), an advanced version of the MRI. While research on fMRI was underway at Harvard University and other institutions at the time, MCW scientists published their first academic paper on fMRI in 1992, which detailed one of the world's first three successful fMRI experiments. MCW's team made significant contributions through the development of a real-time, noninvasive assessment of brain function and the observation of blood flow in the brain. Because blood flow in the brain is linked to the activation of nerve cells that pass along and store thoughts and information, blood flowing to a specific area of the brain indicates that area being used for a specific task, such as controlling motion, storing or recalling memories or processing language.

MCW's research on fMRI was pioneered in the early 1990s by the late James S. Hyde, PhD, professor of biophysics and founding director of MCW's Biophysics Research Institute (now the Department of Biophysics), and two graduate students, Eric C. Wong, MD, PhD, and Peter Bandettini, PhD. They used a magnetic resonance imager to not only look at the anatomy of the brain, but to watch thinking take place. In 1999, MCW scientists would use fMRI to make major discoveries, including a method for diagnosing Alzheimer's disease. That same year, MCW researchers were the first to record the brain working in real time as a person mentally shifts attention from one subject to another or when a person is not paying attention at all.

MCW scientists have published more than 510 scientific articles on fMRI since the institution's pioneering first manuscript in 1992. Researchers throughout the world have cited these papers more than 28,000 times in other published studies. MCW's fMRI researchers have garnered more than $82 million in federal funding from the National Institutes of Health since the early 1990s.

Additional Project Wonder pieces cover such diverse topics as *Redlining, Race, Bias, and Breast Cancer;*[7] *Mitochondria Networks*;[8] *Cerebellum Semaphore*;[9] and *Cardiovascular Regenerative Engineering*.[10]

Da Vinci once said, "To develop a complete mind, study the science of art; study the art of science. Learn how to see. Realize that everything connects to everything else."

Thanks to MCW's basic and translational scientists and in-house and community-based graphic designers, artists, illustrators, and writers, their informative and evocative work underscores how the knowledge we are creating at MCW spans the entire health care continuum and is helping to change lives and communities.

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