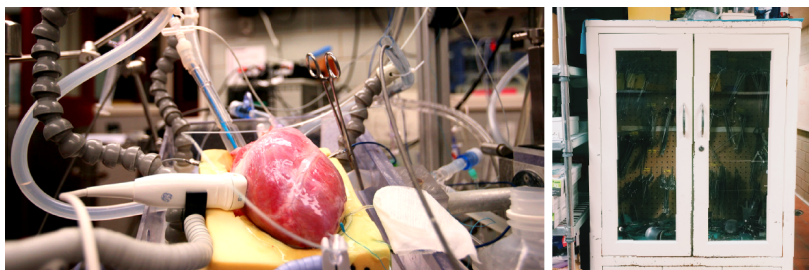


An Underground Lab at the Heart of Cardiovascular Innovation

Designing medical devices for the diagnosis and treatment of cardiovascular diseases requires more than textbook knowledge; it's hands-on learning that enables medical technology innovation. Here are the insights we learned, and now share with you, from our visit to the **Visible Heart® Lab**:



Left: A reanimated swine heart (Credit: Minnesota Public Radio).

Right: Original instruments used by early pioneers of cardiac surgery.

The University of Minnesota's Visible Heart Lab has an impressive history that sets a precedent for hands-on learning. In 1952, Dr. John Lewis performed the first successful open-heart procedure just four floors above the lab, and the first

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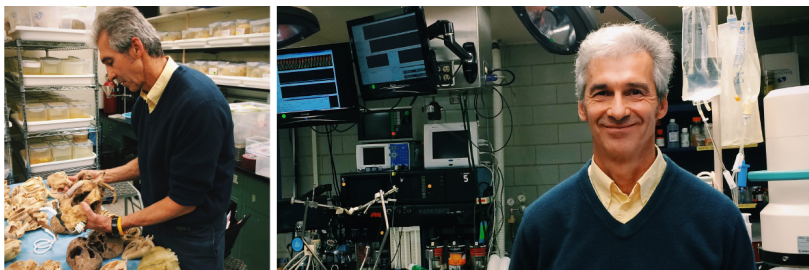


Q+A on Curiosity with Kai Worrell



What is the Residual Risk to Users of Your Device?

clinically usable cardiac pacemaker was later invented here. Founded in 1997, the Visible Heart Lab continues this rich legacy of cardiovascular research and hands-on learning, as the only place in the world where researchers routinely get an up-close look at a beating heart outside the body.



Left: Dr. Paul Iaizzo displays hearts from the lab's specimen library.

Right: Dr. Paul Iaizzo in the lab's operating room.

Today, Dr. Paul Iaizzo oversees the transplant and reanimation process at the Visible Heart Lab, providing researchers with first-hand experience and new insights into the heart's anatomy and function. Data collection begins shortly after the reanimation process, and cameras are inserted to record the functional anatomy within the beating heart. These images and video footage are all part of the [Atlas of Human Cardiac Anatomy](#), a free and publicly accessible educational tool maintained by the Visible Heart Lab in partnership with Medtronic. Researchers from around the world have incorporated these images into conference presentations and textbooks, and physicians have used them to educate patients about specific cardiovascular procedures.

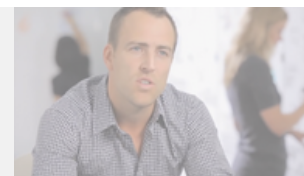


Left: 3D printers create replicas of heart specimens.

Middle: An up-close look at 3D printed heart models.

Right: Right: Dr. Paul Iaizzo explains heart models.

After reanimation, the hearts are eventually added to the lab's collection of more than 400 heart specimens, one of the largest libraries of perfusion-fixed hearts in the world. To share the wealth of knowledge that these hearts have to offer, many of the specimens are recreated using state-of-the-art 3D printers. As long as it's nondestructive to the specimens, designers and engineers can gain access to the collection to see how a device prototype interacts with the heart's anatomy. Over the past 15 years, thousands of researchers and engineers have taken advantage of this unique learning opportunity.



Design We Can All Live With



A Partnership In Minimally Invasive Heart Surgery



Insights From The ER

“ Hands-on learning is at the heart of helping patients. ”

Regardless of your field or background, we can all learn something from the Visible Heart Lab. We asked Professor Iazzo if he had any advice, and he echoed what we had just witnessed in his lab – “hands-on learning is at the heart of helping patients.” It’s one thing to learn cardiac anatomy from a textbook, but to hold a beating heart provides an entirely different perspective. We are much more effective and creative when we can see how a medical device actually functions within the organ. Through first-hand experience, we can gain valuable insights that inform the design process and ultimately improve the lives of patients.

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